Environmental Innovation Program

Land, water and climate solutions for a sustainable future

About Alberta Innovates

Innovation is the catalyst for sustainable jobs, economic and community strength, improved health and environmental benefits. Alberta Innovates leads and accelerates innovation from discovery to use across all sectors in all parts of the province. As Alberta's largest research and innovation agency, we are uniquely positioned to propel great ideas forward to improve the lives of Albertans today and for generations to come.

Alberta Innovates believes the research and innovation (R&I) ecosystem is stronger and more sustainable when it is broadly representative of the overall diversity of the community. Efforts are made to ensure that all interested and qualified parties have an equitable opportunity to participate and contribute to the ecosystem, with inclusive processes at every stage.

Environmental Innovation Program Overview

The Environmental Innovation Program actively assists innovators, entrepreneurs, and industry clients accelerate technology development and deployment, helping companies expand their businesses and competitiveness. Additionally, we support applied research and knowledge translation at post-secondary institutions and other organizations with sightlines to advance environmental sustainability through application of knowledge to support improved policy and best practice. Our collaborative initiatives are designed to foster innovation and promote sustainable practices across various sectors including agriculture, forestry, energy, provincial and municipal governments, and other sectors, with application from forests and grasslands, industrial sites, public and private lands, and large urban centres to rural, remote and Indigenous communities. We provide the Government of Alberta (GOA) with scientific and technical expertise on natural resource management, economic diversification, emissions reduction, and water and land policy issues.

The Environmental Innovation Program has two focus areas for investments in innovation – **Water Innovation** and **Land Management Solutions** - each having several priority areas based on needs identified by stakeholders.

Details of investment and research priorities for the Environmental Innovation Program two focus areas, Water Innovation and Land Management Solutions, are outlined below.

Focus Areas

1. *Water Innovation (WI) - Strategic water solutions for Alberta's future*

Water is vital for life, our communities and the economy. Alberta faces the daunting challenge of managing finite water resources in a sustainable way with a population predicted to almost double in the next 35 years, with the majority of the population living in the more arid south, with continued growth in Alberta's oil and gas industry, and with an agriculture system that irrigates farmland providing some of the most productive crop yields in North America. The increasing and competing demands for water resources are further compounded by the need to protect the health of the aquatic ecosystems,

and with future water supplies becoming increasingly uncertain and more variable due to climate change.

The WI focus area is designed with the goals of the Water for Life Strategy in mind including safe, secure drinking water; healthy aquatic ecosystems; and reliable, quality water supplies for a sustainable economy.

We support innovation that will:

- Help create a cleantech industry in water treatment;
- Enable continual improvement in water use, conservation, efficiency and productivity;
- Provide safe, secure and reliable water resources while maintaining healthy aquatic ecosystems.

Investments in the WI focus area prioritize research and innovation that specifically target knowledge and technology gaps in support of Alberta's Water for Life Strategy goals.

Investment Priorities in Water Innovation

Theme 1: Future Water Supply and Watershed Management

All major rivers in Alberta derive their water from the Rockies. Given that most Albertans use water from surface water sources, it is important to understand the ability of these mountain and foothill systems to continue to provide a stable water supply to Alberta's rivers and watersheds. Even though it is out of sight, groundwater also plays a significant role in water supply for our economy and communities. Surface water and groundwater are interdependent; both are influenced by climate change, how we use the land and increased economic activity. Holistic approaches are needed to build understanding of impacts and develop strategies to sustainably manage our water supplies.

Priorities in this theme include:

- Improve understanding of the impact of climate change on water supplies (including development of adaptive strategies);
- Characterize groundwater resources and its role in sustainable water supply (including development of best management practices);
- Understand the impact of increased economic activity and population on water resources (including development of adaptive strategies);
- Improve understanding of risks to source water and headwater supplies (including development of management strategies);
- Develop holistic approaches to managing water supplies (consider land-use, groundwater and surface water, water-energy-food nexus).

Theme 2: Healthy Aquatic Ecosystems

Healthy aquatic ecosystems are vital to a high quality of life for Albertans and provide critical ecological goods and services. Alberta's growing population and economy, coupled with increasing impacts from climate variability and global change, will impact the health of aquatic ecosystems. Tools and strategies are needed to mitigate and manage these impacts.

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Priorities in this theme include:

- Mitigate and manage impacts of nutrient loading on Alberta lakes;
- Mitigate and manage impacts of invasive species;
- Mitigate and manage impacts of human-derived contaminants on aquatic ecosystems;
- Improve understanding of cumulative landscape-level impacts and develop mitigation strategies;
- Develop tools and strategies to conserve and enhance riparian areas;
- Improve understanding of the efficacy of wetland restoration and reclamation.

Theme 3: Water Use Conservation, Efficiency, and Productivity

Water is a vital element of our economy and our communities. While Alberta is considered a water rich province, only so much water can be sustainably pulled from the system. Improving the conservation, efficiency and productivity (CEP) of water use enables the growth of our economy and communities while still preserving critical environmental flows. Significant improvements in CEP have been made in the last decade, yet more progress is needed to meet the water needs of Albertans. In addition to CEP strategies and technologies, tools are needed to inform decision making and development of business cases to enable implementation.

Priorities in this theme include:

- Develop strategies and technologies for municipal wastewater and stormwater reuse;
- Develop strategies and technologies to improve industrial water use efficiency (focus on southern Alberta/areas with restricted water use);
- Develop strategies and technologies to improve water management in the agricultural sector;
- Develop integrated (cross-sector) approaches to conservation, efficiency and productivity (consider water-energy-food nexus);
- Develop risk-based decision tools supporting water management;
- Develop full cost accounting tools supporting water management;
- Understand impacts of conservation, efficiency and productivity efforts on aquatic ecosystems and watershed supplies.

Theme 4: Water Quality Protection

All Albertans have the right to access safe, secure water supplies. Protecting Alberta's water for safe use and consumption requires a detailed understanding of the input and impact of contaminants to both surface and groundwater, particularly non-point source inputs and emerging contaminants (micro-plastics, pharmaceuticals, etc.). Climate variability and evolving land management practices will also impact the quality of Alberta's water and challenge conventional water treatment for a growing population. While water quality challenges are being faced across the province, rural, Indigenous, and remote communities are in critical need of a focused approach to their unique water security issues.

Priorities in this theme include:

- Develop low-cost solutions and strategies to address drinking water and wastewater challenges in small, Indigenous and/or remote communities;
- Understand, mitigate and manage non-point source contamination;

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- Understand, mitigate and manage contaminant impacts on water supplies (focus on emerging contaminants);
- Improve understanding of the impact of climate variability and land management practices on water quality (including development of best management practices);
- Support safe oil sands mine water release (including development of low-energy mine water treatment options).

2. Land Management Solutions (LMS) - Balancing Land Use and Conservation

Alberta's primary natural resource industries provide tens of thousands of jobs and are pillars of the provincial economy. They operate in highly competitive global markets and are heavily reliant on broad access to the provincial land base to sustain operations. This access is managed by government policy and regulations, and is at times constrained by other uses that are valued for supporting local economies (e.g., tourism and recreation), livable communities, traditional land uses, biodiversity conservation and provision of ecosystem goods and services on which all life is dependent. Natural resource industries are also facing a high degree of uncertainty and increasing costs from external and largely uncontrolled threats that are being driven by a warming climate, severity of forest fire, prolonged drought, extensive insect outbreaks (e.g. Mountain Pine Beetle) and disease.

This focus area is designed to help ensure that natural resources industries continue to thrive now and into the future. LMS goals are firmly grounded in provincial policy objectives for efficient land use, conservation and stewardship, and environmental cumulative effects management. They are informed by provincial government legislation (e.g. in the Alberta Land Stewardship Act, Publics Land Act, Provincial Parks Act, Forests Act, Environmental Protection and Enhancement Act, Alberta Wildlife Act, etc.) and policy guidance (e.g. Premier's mandate letters). The LMS focus area has been designed to support innovation that leads to:

1) Efficient land use management that enables Alberta's natural resource sectors to access and utilize land resources while successfully balancing the needs of other critical land uses;
2) Functional terrestrial ecosystems that support sustainable communities through the continued provision of ecological goods and services;
3) Conservation of Alberta's biodiversity legacy for the enjoyment and benefit of future generations.

By investing in the next generation technologies, processes and new knowledge in service of these goals, the LMS focus area will assist researchers, entrepreneurs and end-users to find solutions to the challenges Alberta's natural resource industries face while at the same time capitalize on opportunities that emerge for improved economic, social and environmental outcomes.

Investment Priorities in Land Management Solutions:

Theme 1: Efficient Land-use

Land is a limited resource, and competition is high in many areas of the province from competing interests. Different land uses often do not easily overlap in space and time, or may be seen as fundamentally incompatible, which can result in poorer overall outcomes on balance when preferential access is obtained, sometimes for decades, by one or a few primary land users. While large economic benefits or other considerations may make trade-offs among land uses ultimately acceptable to decision-makers, efforts can be made to more efficiently manage land use in ways that, without compromising the value return, limit the time and extent to which certain activities

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have priority, to better enable multiple overlapping uses, or to ensure that other land uses are positioned for success once primary users have relinquished tenure.

Priorities in this theme include:

- Footprint avoidance or reduction:
  - Prior to development through improved design and technology adoption;
  - Post land-use through active / ecological restoration;
- Site rehabilitation:
  - Remediation and reclamation (well sites, oil sands tailings, other industrial disturbances);
- Integrated land management:
  - Enabling of overlapping or sequential activities that optimizes multiple outcomes (within and across resource sectors on shared and adjacent land-bases);
  - Efficient access management (e.g. use of same roads, utility corridors);
  - Shared resources (e.g. use of borrow pits, machinery).

Theme 2: Climate Adaptation

Climate change is having a significant impact on land resources across Alberta. Industry, communities and other land users are confronting threats such as historic levels of wildfire, reduced access to remote locations and heightened food insecurity. Better tools and practices are needed to adapt to these evolving environmental conditions, which are expected to accelerate and intensify in the coming years.

Priorities in this theme include:

- Improved fire and pest risk assessment and response;
- Adaptive forest silviculture and harvesting practices;
- Enhanced biodiversity conservation (e.g., bio-refugia, corridors/linkages, assisted migration);
- Model development (bioclimatic, species-habitat, etc.);
- Disease/insect infestation, invasive species management.

Theme 3: Nature-based Solutions

Alberta's land-based ecosystems perform numerous natural functions, many of which can be viewed as "goods and services" when leveraged to support human needs. Increasingly, nature-based solutions are being sought to address environmental challenges as they can be relatively inexpensive (compared to engineered systems), provide multiple simultaneous benefits and can be the most effective option available. As the climate warms, earth's natural systems may provide the most potent weapons in our arsenal to manage impacts and reduce atmospheric carbon levels over time.

Priorities in this theme include:

- Species at risk (e.g., understanding and mitigating threats to survival, identify technology and practices to support recovery);
- Carbon sequestration (understanding and enhancing forest-grassland-wetland soil carbon stores, reforestation and afforestation);
- Water management (landcover and land use impacts on water resources);

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- Practices which support ecosystem and species-level resilience;
- Species management (e.g. bio-controls for invasive and episodic species).

Theme 4: Environmental Monitoring and Modeling

Effective monitoring is crucial to understanding the state of environmental conditions and ensuring that land use decision-making is properly informed. Technology development has been transformative in this area in recent years, including launches of high-resolution, multispectral commercial satellite platforms, new generations of autonomously operated UAVs (unmanned aerial vehicles), terrestrial eDNA technologies, in situ soil contaminant sensors, broad internet availability in remote areas and AI/ML tools that draw insights from Big Data. With continued technology development and thoughtful integration, Alberta could move from the current fragmented, multi-party, multi-system monitoring approach to a singular, automated and cost-effective monitoring system capable of surveying the terrestrial environment 24/7/365 from local to regional scales.

Priorities in this theme include:

- Land cover, soil and carbon monitoring;
- Biodiversity monitoring (eDNA, camera traps, Automated Recording Units, etc.);
- ML and AI-driven data analytics, Big Data management;
- Environmental models (conceptual, empirical, process-based, integrated).

Environmental Innovation Program Expected Outcomes

The Environmental Innovation Program is designed to propel Alberta towards sustainable resource management and thriving communities through strategic, holistic, and cross-sectoral investments and initiatives. By aligning with stakeholders' priorities and addressing critical challenges, the program not only transforms these challenges into opportunities for economic, environmental, and social sustainability but also fosters economic diversification in Alberta while promoting a sustainable and resilient environment.

The expected outcomes are:

- **Technical Advancements:** Accelerate the commercialization of innovative technologies that enhance environmental sustainability across multiple sectors, positioning Alberta as a leader in sustainable development.
- **Knowledge to Practice:** Translate research and knowledge into actionable policies and practices that support environmental stewardship and resilience.
- **Socio-Environmental Benefits:** Improve community well-being and create a healthier environment by reducing greenhouse gas emissions, optimizing water usage, and restoring Alberta's lands, waters, and biodiversity, thereby mitigating the environmental impacts of development.
- **Economic Growth:** Stimulate economic development and diversify industries by creating new business opportunities through strategic investments in environmental solutions.
- **Collaboration:** Strengthen economic, environmental, and community resilience by fostering cross-sectoral collaboration and integration, enabling Alberta's innovation ecosystem to effectively navigate environmental and economic challenges.
- **Talent and Capacity Building:** Develop strong partnerships between industry, academia, and other stakeholders to nurture the next generation of talent, expertise, and knowledge, driving continuous innovation and building capacity to ensure long-term sustainability and progress.

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How to Apply

The program uses a continuous intake process, as described in the Agriculture and Environment Application Guide. The application guide can be accessed from our online application portal under funding opportunities – click here. In addition, periodic calls for proposal (also known as funding competitions) will be issued to award grant funding. Each call for proposals will have specific priorities and criteria, along with a dedicated program description and application process guide.

Contact Information

Environmental Innovation (EI) Team - click here for contacts

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