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PARTICIPATION IN DETERMINING
SCIENCE AND RESEARCH
PRIORITIES IN ALBERTA

QUICK FACTS

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This 'Quick Facts' Report is a summary of the Stage Two Background Report. Please refer to this Stage Two Background Report for detailed information about each research application area (RAA). We have condensed the Background Report for ease of use while answering the Faxback Worksheet and Questionnaire. It will also act as a reference guide for participants in the workshops.

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Process
Development

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1. Agriculture and Agricultural Products



Crop development, livestock development, food products, farm equipment, sustainable agricultural systems (including soil and water conservation and waste management)

A Big Business — Global Demand for Food Production Increasing

- Alberta's annual sales of \$10 billion represents 24% of Canada's agriculture production
- Exports increasing in response to NAFTA, GATT and Alberta's marketing efforts
 - over \$1.4 billion in exports to the United States
 - over \$504 million to Japan
 - over \$1.13 million to China
 - over \$42 million to Taiwan in 1993
- The industry employs 105,600 people
- Agriculture has a clean green image

Extensive Infrastructure

- Department of Agriculture, Food and Rural Development
- Universities - Alberta, Calgary and Lethbridge
- Colleges - Olds and Lakeland
- Agriculture and Agri-food Canada's research centres
- Over 380 private sector companies

Strong Research Networks and Partnerships

- Research in biotechnology and other new technologies promises new products and major improvements in food production and processing and in waste management

Active Research Programs

- Provincial research of \$29 million
- Agriculture Research Institute On-Farm Demonstration Program with \$3.3 million in matching grants from producers
- Alberta-Canada Barley Development Project
- Canada-Alberta Environmentally Sustainable Agriculture Agreement
- Chinook Applied Research Association's projects on semi-arid land

Growth Opportunity

- Value-added food products

2. Art and Culture



Visual, performing and literary arts, art history, cultural studies, industrial design and commercial art

An Important Business that Enhances Quality of Life

- Contributes to cultural and social well-being
- Influential in determining where people decide to live and work
- Contribution to the economy \$1.3 billion directly and \$0.6 billion indirectly
- Employs over 58,000 directly and 21, 000 indirectly

Extensive Infrastructure

- Alberta Community Development Cultural Facilities and Historical Resources Division is responsible for cultural preservation
- 19 Provincial museums, interpretive centres and historical sites
- Northern and Southern Jubilee Auditoriums and concert halls
- 30 arts festivals annually
- 46 performing arts companies
- 20 sound recording studios

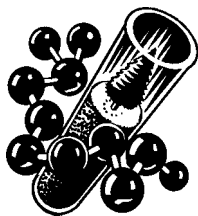
A Different Kind of Research

- Research concerned with the creative processes of artists largely funded by sales of the products created
- Alberta Foundation for the Arts and the Canada Council provide support to the arts and culture industry
- Diminishing government support
- Partnerships with the private sector increasing

Growth Potential in Cultural Expression, Entertainment and Communications

- New products created for the information highway
- UofA and UofC are part of Technology Based Learning Network of Centres of Excellence
- Activity linked to growth in cultural tourism
- A record of our past and changing present, and a pointer to our future

3. Biotechnology



Gene therapy, genetic engineering and xenobiotics, pharmaceuticals, diagnostic equipment

Biotechnology Contributes to Economic Growth and Enhanced Quality of Life

- A growing industry
- Applications in medicine, agriculture, industry, and the environment
- Investment in research attractive
- Products have export potential
- 25 biotech companies in Alberta employ over 500

Fledgling Infrastructure

- Research networks, partnerships involving universities, research centres, and private industries attracted \$20 million in industry funding
- Alberta Research Council's fermentation pilot plant and Biotechnology Department do contract research
- Alberta Environmental Centre does environmental biotechnology
- Alberta Heritage Foundation for Medical Research supports some medical biotechnology researchers
- Alberta Agricultural Research Institute supports biotechnological research focused on agriculture
- UofA has Biotechnology Centre in Agriculture, Food and Nutritional Science
- UofC has Faculty of Medicine and Centre for the Advancement of Health
- UofL does plant biotechnology
- Lethbridge Research Station of Agriculture and Agri-Food Canada conducts agricultural biotechnology research

Issues

- Expected short fall of qualified people
- Technology transfer, ethics and safety
- Research results have been commercialized largely outside of Alberta

4. Community Services



Government, law and order, family and social services, child welfare, consumer product safety, building, and fire safety, occupational health and safety, workplace stability and financial services

Community Services Influence our Quality of Life

- There are benefits of maintaining law and order, provision of legal services, access to social programs, and to legal aid
 - Business management areas and the financial and stock markets are important research areas to encourage and sustain economic growth
 - The findings of research (although not commercial) can be shared with partners across Canada
 - Community Services are derived from research in social welfare
- Consumer product safety important for imports and exports
 - Occupational demand studies and labour force modelling studies are critical in workforce management

Infrastructure

- Alberta Family and Social Services
- Department of Justice ensures equality and fairness in administration of justice
- Alberta Law Reform Institute
- Labour Relations Board
- Alberta Education's Special Education Board and Career and Technology Studies program

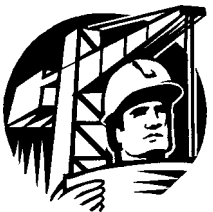
Research Serves the Public and Business Communities

- Improved social programs
- Safe Communities Pilot Project
- Student Violence Prevention Project
- Economics
- Accident prevention
- Improved employer / employee relationships

For Alberta's High Wage, High Productivity Workforce Accident Prevention is Imperative

- Department of Labour is responsible for occupational health and safety
- Plumbing and Gas Safety
- Alberta Fire Training School
- Radiation Health and Safety
- Alberta Boilers Safety Association
- Petroleum Tank Management Association of Alberta

5. Construction



Architectural and engineering services, road building, residential and commercial construction, facility management, restoration and renovation, demolition and salvage, and municipal infrastructure

Construction Industry Competes Nationally and Internationally

- Expertise in construction for severe weather conditions recognized internationally
- Construction provided \$9.3 billion in services with exports of \$1.9 billion
- 13,000 employers hire 80,000 full time and 15,000 peak time employees

Infrastructure

- Little construction research funded by the Alberta Government, most research support is provided by federal government organizations
- Universities and technical institutes have facilities to assist the industry
- The Alberta Research Council has testing facilities
- The Centre For Engineering Research does research on structures and materials

Application of Research Results

- Research results in better local structures and increased exports of products and services
- Residential housing contractors are developing new material management systems that substantially reduce the environmental impacts of construction
- Research at the concept and design stages provides bigger payback than at the construction, operation and maintenance stages
- New computer technologies are impacting on current practices
- Extension of the life of highway infrastructure through new materials and pavement management systems

Receptor Capacity

- Most companies are not in a position to utilize new technologies because of their small size, the market's focus on low price, and the overall conservatism of the industry, e.g. building codes

6. Education



Academic and training courses, consulting services, educational products, basic education, secondary and post secondary education, life long learning

Qualified Personnel are Essential for a Strong Economy

- The basis for development in all other areas
- Nationally recognized institutions
- \$190 million of Advanced Education's operating grant to universities goes to support research infrastructure
- Increasing demand for educational products world wide
- Education and training services marketable internationally
- Exports of products and services is a source of funds at time when government funding for education is declining
- It is becoming more difficult to prepare students adequately for the future and to retrain the existing workforce

Infrastructure

- Alberta Education (early childhood services to grade 12) serves 66 school jurisdictions, 2000 schools, and 30,000 teaching staff
- Capacity for research and development is considerable
- Alberta Advanced Education and Career Development: 35 post secondary institutions, 4 universities, 2 technical colleges, and 80,000 students
- Sector focused training initiatives such as the Alberta Tourism Educational Council

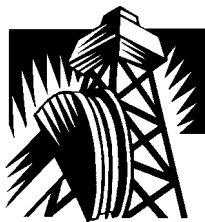
Active Research Areas

- Research in education focuses on improving teaching methods, performance measurement, and labour market statistics

Research Benefits

- The development of computer based training material has the potential to revolutionize instruction
- Behavioral and sociological research on training people to work with each other has many benefits

7. Energy Production



Fossil fuel resource evaluation and mapping, recovery and process development, electrical generation, and renewable energies

Largest Contributor to Provincial Economy and Exports

- Expenditures of \$20 billion
- The oil, gas and petrochemical industries represent 62% of Alberta's exports and employ 22,000 people directly and an additional 20,000 indirectly
- The coal industry exports \$500 million annually and employs 2500 people directly and an additional 5000 indirectly
- Alberta provides 31% of Canada's petroleum needs
- Alberta provides 12% of the natural gas consumed in the United States

Very Large Infrastructure

Industry

- Oil and Gas exploration and production companies
- Services companies such as geophysical (150), drilling (100), and well service (66), service and supply (650) companies
- 4 electricity generating utilities
- Coal mining companies

Research

- Universities
- Alberta Research Council
- CANMET Western Research Centre
- Petroleum Recovery Institute
- Energy company research laboratories

Research Alliances

- AACI Research Program for in situ oil production
- National Centre for Upgrading Technology (NCUT)
- Industry research alliances (e.g. CAPP, CONRAD)
- Development by multinational companies
- Petroleum Technology Alliance Canada

Opportunities for Application of New Technologies

- Seismic and sub-surface surveys
- Improved in-place oil recovery
- Bitumen recovery from oil sands
- Hydrogen fuel cells

8. Energy Products



Equipment for exploration, production, transportation, distribution, storage, refining, processing, petrochemicals and value-added products

A Big Industry Focused on Adding Value to Energy Products

- 250 oil and gas equipment manufacturers
- 1,850 equipment manufacturers and service providers
- 14 petrochemical and chemical fertilizer companies
- Employs 9200

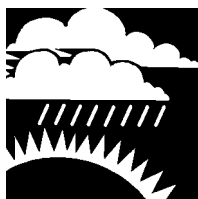
Infrastructure

- Alberta Government funding primarily limited bitumen and heavy oil upgrading
- National Centre for Upgrading Technology (NCUT)
- Alberta Research Council works in equipment development, and value added chemicals
- Private sector is a major funder and performer of research
- Alberta Sulphur Research Ltd.
- Environmental Science and Technology Alliance of Canada (ESTAC), an alliance of industry, the federal government, and universities, funds research through its chemicals division

Growth Potential

- New catalysts
- New plastics and advanced composites
- Advanced materials
- Advanced equipment and value-added petrochemical products exports are expected to increase

9. Environment



Protection of air, land and water resources, sustainable forest and wildlife management, recreation areas, recycling, waste management, and environmental health

Environmental Quality is a Vital Element in Alberta's Competitiveness

- Government sets standards, enforces regulations, and conducts research on interactions between human activity and the environment
- Companies and government agencies manage their operations in light of regulation or potential impact on the environment
- Industry and Government are served by the Environmental Industry, which
 - consists of 800 companies, with
 - \$600 to \$700 million in annual revenues, and
 - employs 8,000 people

Infrastructure

- Alberta Environmental Protection
- Alberta Environmental Centre
- Environmental Appeal Board
- Natural Resources Conservation Board
- Alberta Research Council
- Alberta Agriculture Food and Rural Development
- Universities and Colleges
 - Environmental Research and Studies Centre (U of A)
 - Eco-Research Chair in Environmental Risk Management (U of A)
 - Macleod Institute — The Environmental Research Centre (U of C)

Industry / Government Research Partnerships

- Tire Recycling Management Board
- Networks of Centres of Excellence: Sustainable Forest Development

Research Leads to Economic Benefits in Resource Industries, Agriculture, Tourism and Health

- Sustainable forest development
- Sustaining fish and wildlife populations and habitat
- Pest management
- Control of weeds
- Restoring productivity to contaminated lands
- Hazardous waste management
- Water quality assessment and protection

10. Forestry and Forest Products



Forestry, agriforestry, value-added wood products, lumber and building materials, machinery, equipment, supplies and services, pulp and paper

4th Largest Economic Sector in Alberta

- 300 primary and 700 secondary wood processing companies
- 10 pulp and paper mills
- Shipments \$4 billion
- Exports \$2.5 billion
- Employs 50,000

Infrastructure

- Forest Industry Development Branch of Economic Development and Tourism
- Cooperative Overseas Market Development Program
- Wood Panel Bureau Alliance
- Alberta Research Council
- University of Alberta Sustainable Forestry Centre of Excellence
- National Forest Products Association
- Alberta Forest Research Advisory Council
- Pulp Mill Process Control Partnerships
- Forintek
- Mechanical Pulping Consortium Research Program

Active Research Areas

- Application of biotechnology to improve seed stock
- Sustainable forestry management
- Development of value-added products such as engineered wood composites
- Improved effluent treating systems
- Products from wood residues and underused fibres

11. Health and Medical



Health services, health informatics, medical devices, pharmaceuticals and health-care products, environmental health

Medium Size Business that is Vital to All

- Large government investment in health research
- 40 manufacturing companies employ 250

- \$35 million in annual sales of which 80% are exports
- 30 health-care services companies and associations
- Numerous medical assay and radiology labs

Infrastructure

- Alberta Health
- Alberta Heritage Foundation for Medical Research (AHFMR)
- Cross Cancer Institute and Tom Baker Cancer Centre
- Walter C. MacKenzie Health Sciences Centre
- Foothills Hospital
- Universities, Technical Institutes and Colleges
- Regional Health Authorities

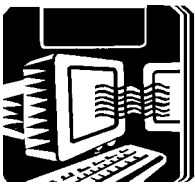
Current Research Capacity Unusual

- AHFMR invests \$30 million annually in the prevention and cure of diseases
- Effectiveness of health services
- Diabetes research
- Protein Engineering, Bacterial Diseases, and Neuroscience Groups in the Network of Centres of Excellence
- Alberta Gene Therapy Infrastructure Program
- Provincial Cancer Clinical Trials Network
- Cancer Research Endowment

Good Mental and Physical Health is Necessary for a Productive Society

- Health informatics research will have positive impacts in several areas
- Products have export potential
- The government has a role in safeguarding the health of the public
- Research on nutrition and lifestyle as determinants of health is an emerging field
- Developments in biochemistry, immunology and biotechnology will improve the treatment of chronic and acute illnesses

12. Information and Communications



Interactive services, software development, hardware and electronics, information processing and storage, networks, phone systems, and information dissemination

A Fast Growing Business Sector

- 220 electronics and telecommunications manufacturing companies have \$1.5 billion in sales and employ 7,500
- 8 telecommunications service providers have annual revenue of \$1.57 billion and employ 10,000
- Over 80% of products are exported outside Alberta
- 1300 software/computing service companies employ 14,000

Infrastructure

- Alberta Learning Network
- Alberta Microelectronics Centre
- TRILabs
- Universities and Technical Institutes
- Alberta Research Council
- AGT, EdTel
- Radio and television companies

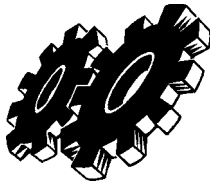
A Research Intensive Area

- Basic and pre-competitive research funded by the federal government
- More applied research is funded through joint industry - government partnerships
- Canadian Network for the Advancement of Research, Industry and Education
- Western University Research Consortium on High Performance Computing and Networking

An Attractive Area

- New products and services increase competitiveness of Alberta companies
- Excellent export potential of products and services
- Nanotechnologies have future potential
- It is a clean industry which can employ many people

13. Manufacturing



Marketing, product design, conversion of raw materials to finished goods, control systems, servicing, emission control, waste reduction, and recycling

A Diverse and Growing Industry

- Dominated by companies that process Alberta's natural resources
- 103,900 employed in 14 different manufacturing industries
- 80% of firms employ fewer than 20 people
- Shipments of \$25 billion
- \$7.7 billion in exports
- Plastics and advanced materials industries are growing rapidly

Fragmented Infrastructure

- Alberta Research Council
- The Laser Institute
- Centre For Engineering Research
- Manufacturing Engineering Division of University of Calgary
- Sherritt Inc.
- Manufacturing companies

Research

- Most of the research is done by industry
- Development and substitution of new materials
- Development of new equipment and integration with computer technologies
- New product design, design for "manufacturability" and assembly

Building on Strengths

- Developments in advanced materials
- WestAIM receives \$7.5 million for manufacturing research leading to commercialization
- Improved automation and control through the introduction of robotics and intelligent manufacturing systems
- Growth in new high tech products and import replacement opportunities

14. Mineral Production and Products



Precious metals, base metals, rare earths, metallic minerals, industrial minerals

A Small but Important Industry

- very minor activity in exported metals—shipments of \$50 million
- major activity in locally used industrial minerals—shipments \$700 million

Infrastructure

- Universities
- Alberta Geological Survey
- Geological Survey of Canada
- Sherritt Inc.

Limited Government or Industry Funding of Research

- Geological theories and models
- Mineral exploration
- Production/extraction
- Upgrading
- Refining
- Recovery of minerals from oil sands tailings
- Value-added products

Issues

- A knowledge gap exists in resource evaluation
- Diamond potential important opportunity
- Potential for a larger metallic minerals industry
- Economic analysis

15. Tourism



Ecotourism, cultural tourism, adventure tourism, rural tourism

A Huge Market

- With the exception of energy and agriculture, tourism leads all other industries in terms of economic impact
- \$3.1 billion in visitor expenditures
- Some government activity in marketing
- Most tourism promotion is done by tour companies and owner / managers of attractions

Infrastructure

- Tourism Development Branch
- Alberta Community Development
- Alberta Tourism Partnership
- Alberta Tourism Industry Association
- Alberta Urban and Rural Municipalities

- Alberta Environmental Protection
- Alberta Tourism Education Council

Many High Class Attractions for Visitors

- Natural beauty spots known world wide
- Parks and recreation facilities
- Museums, galleries, concert halls, theaters
- Festivals
- Hotels and camping sites

Research

- Research studies will improve our ability to capture a larger proportion of the national and international markets
- Finding an appropriate balance between increased tourism and preservation of the values that make the Province attractive

16. Transportation



Public transportation, on- and off-road vehicles, road, rail, water, and air transportation, commercial transport, aeronautics, disaster and emergency preparedness

Essential in supporting all economic activity in Alberta

- Transportation of goods and people is an increasingly important element in competitive advantage for companies and regions
- GDP (1992) was about \$ 3.3 billion
- Employment (1995) was about 66,000
- Safety is of prime consideration

Infrastructure

- Alberta Transportation and Utilities
- Municipal governments
- Bus companies
- Taxi companies
- Trucking companies
- Railways
- Airlines
- Alberta Road Transportation Technology Transfer Centre

Research

- Government programs undertaken jointly with other provincial governments and industry
- Technical surveys
- Canadian Strategic Highway Research Program/United States Strategic Highway Research Program
- Research and Development Council of the Transportation Association of Canada

New Opportunities

- Global positioning systems and geographic information systems will change operations of transportation companies
- Automated systems for scheduling and routing improve operating efficiencies