

## CHAPTER 12

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# SCIENCE AND TECHNOLOGY

Science and technology (S&T) is a term used to encompass activities which involve the generation, dissemination and initial application of new scientific knowledge and technology. In Canada S&T is used to foster the development of natural resources, to aid industry, and to stimulate economic growth both nationally and regionally. The federal and provincial governments, industry and universities fund and perform S&T.

Science and technological activities are undertaken in the natural sciences and engineering (NSE) and in the social sciences and humanities (SSH). In both of these fields of science two types of scientific endeavour are undertaken: research and development (R&D) which is creative work undertaken on a systematic basis to increase the stock of knowledge; and related scientific activities (RSA) which are activities that complement and extend R&D by contributing to the generation, dissemination and application of scientific and technological knowledge.

In this chapter the primary focus is on the federal resources devoted to S&T including federal support to industrial development, basic research and the development of highly skilled people through the university sector. More funds were spent in the National Capital Region (37%), than elsewhere. Ontario is the second largest recipient of federal science funds (20%) and Quebec is the third (15%). The western provinces received 19% and the Atlantic provinces, 8%.

### 12.1 Federal resources for science and technology

Total expenditures for S&T were estimated at about \$4.4 billion in 1988-89, an increase of almost 6% over 1987-88. This represents 3.3% of the government's total spending estimates. Over 60 federal departments and agencies spend funds for S&T to support departmental missions and to aid industrial development through both in-house (intramural) activities and by funding S&T to be performed by the private sector (extramural). Basic research in the university sector is funded by the

government primarily through three granting councils: the Natural Sciences and Engineering Research Council, the Medical Research Council and the Social Sciences and Humanities Research Council.

Approximately 33,000 persons were engaged in performing the government's S&T activities in 1988-89, slightly lower than the previous year. The largest employers were Agriculture Canada, Statistics Canada, Environment Canada and the National Research Council.

#### 12.1.1 Natural sciences and engineering

In the natural sciences such as biology, chemistry, physics, astronomy and geology and in engineering, estimated expenditures were \$3.6 billion in 1988-89, with \$2.6 billion (72%) for R&D and \$1.0 billion (28%) for RSA. Most of the RSA expenditures (\$319 million) were for data collection in a wide range of activities, from the monitoring of acid rain for environmental protection to wildlife surveys.

About 48% of R&D expenditures were for intramural activities, 23% for R&D performed by industry and 21% for R&D performed by the university sector. The remaining expenditures were for R&D by private non-profit organizations, provincial and municipal governments, the foreign sector and other Canadian performers.

Since 1983-84 total expenditures in natural sciences and engineering have increased by 27%; R&D increased by 22% and RSA increased by 39%.

Human resources for R&D in the natural sciences and engineering totalled 14,920 person-years and for RSA, 9,290 in 1988-89.

Further details of the five largest participants are provided in section 12.2.

#### 12.1.2 Social sciences and humanities

The social sciences and humanities embrace all disciplines involved in studying human actions and conditions and the social, economic and institutional mechanisms affecting humans. Estimated 1988-89 expenditures in this field of