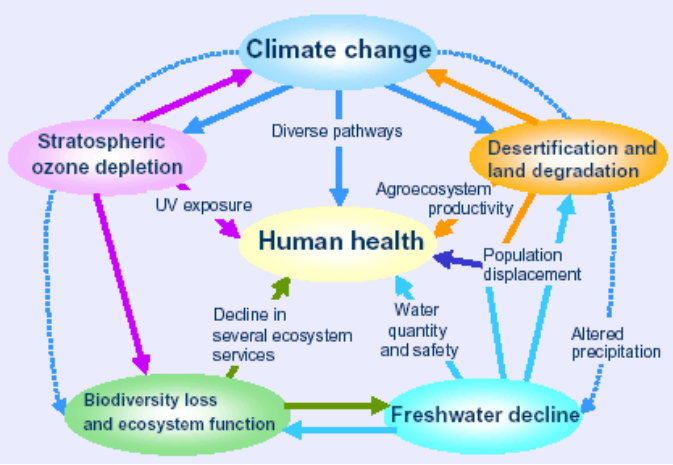
Environmental Factors Affecting Health

Environmental factors affect human health in important ways, both positive and negative.

– **Positive** environmental factors sustain health, and promoting them is preventive medicine. They include:
  - sources of nutrition (*farming*: soil quality, water availability, biodiversity/bio-integrity, genetically modified organisms (GMOs); h*unting, fishing*: wildlife, fish populations.)
  - water (drinking, cooking; cleaning / sanitation);
  - air quality;
  - ozone layer (protection from UV, cancers, etc);
  - space for exercise and recreation;
  - sanitation / waste recycling and disposal.



Courtesy of WHO

– **Negative** environmental factors are threats to health, and controlling them is public environmental health. They include:
  - environmental conditions favouring disease vectors (endemic and exotic vectors);
  - invasive biota (viruses, bacteria, etc), their hosts and vectors;
  - environmental disruptions: floods, droughts, storms, fires, earthquakes, volcanoes;
  - air quality: pollen and pollution leading to respiratory diseases or cancers;
  - water quality: biotic and abiotic contaminants; integrity of water transport and treatment infrastructure;
  - monitoring and management of municipal, agricultural, industrial outflows to the environment (gases, liquids, solid wastes);
  - human changes of the environment that
    - create conditions that favour disease;
    - disturb and release noxious levels of previously bound chemicals (e.g. mercury released becomes poison) or biota (e.g. methane released from thawed peat contributes to climate change);
    - create temporary, intense, life-threatening heat islands (e.g. urban heat waves exacerbated by climate change);
    - result from nuclear, biological or chemical warfare or terrorism;
  - disruption caused by other war and violence.

At the World Summit on Sustainable Development, Canada announced $3 million to support the initiative *Strengthening Health and Environment Linkages: from knowledge to action*. The Initiative will bring together scientific, technical and socio-economic information on environment and health linkages, and transfer that knowledge to inform decision-making at the local, regional and national levels.

Canada is principally concerned with the health of Canadians. This involves health factors in Canada and in biologically-shared health regions (shared geography or exposure through trade and travel). Canada also supports international health initiatives, such as determining health risks through environmental analysis of disease vectors in Africa or Asia.

Key players

- What and who drive the attention to various health programs in Canada:
  - Medical universities and researchers are raising the profile of how environmental factors affect health, and may be interested in exploring how space can better support environmental monitoring efforts;
  - federal and provincial/territorial health agencies (e.g. Health Canada) have a strong interest in exploring how space can reduce downstream health expenditure;
  - World Health Organisation has the ability to influence how environmental factors are perceived and dealt with through public policy;
  - Medical and hospital associations;
  - Nutritionists;
  - Emergency preparedness and response organisations;
  - NGOs;
  - Medical, environmental, and general media.

- Main sources of funding:
  - Government of Canada, through Health Canada and its environmental factors programs;
  - Provincial Governments, through Ministries of Health;
  - Canadian Health Institutes through research programs dedicated to environmental health factors.

- International initiatives:

Canada's **International Development Research Centre** (IDRC), largely funded by CIDA, is a leader in ecosystem approaches to human health. They support research on the relationship between all components of an ecosystem to define and assess priority problems that affect the health of people and the sustainability of their ecosystems. In pursuing the aim of improving human health and well-being while simultaneously maintaining a healthy ecosystem, the emphasis is on the design of solutions based on ecosystem management rather than health sector interventions. http://www.idrc.ca

"Hot" issues

- Introduction of new diseases and disease vectors to Canada through trade and travel, including diseases that can move from animals to humans;
- Northern health and environmental contaminants in humans and in wild food;
- Climate change-induced range expansions of disease vectors and environmental conditions that disfavour human health;
- Spills and leaks of hazardous substances from transportation or deteriorating storage containers;
- Fisheries: nutrition maintenance re: wild fish depopulations; human and fish health effects from fish farming; harmful spatial/biological interactions of wild fish and farmed fish and aquaculture installations;
- Risk posed by bio-warfare and bio-terror;
- Uncontrolled spread of GMOs (e.g. by wind, by water, by animal carriers) contaminating natural genetic material.

Space and Environmental Factors Affecting Health:

Environmental information and environmental management contribute to the maintenance and restoration of health. Space based EO and communications can play roles in:

- Environmental information for optimising use of health resources; distribution of and access to health advice & treatment (i.e. to health staff, treatment facilities).
- Short range environmental prediction for avoidance of high risk situations, and to guide immediate health system responses. Managing acute risks; adapting to them (e.g. temporary moving of vulnerable elderly from monitored/predicted intense heat islands).
- Modeling of health impact of environmental parameters; prediction of longer-term health resource needs, and environmental planning and remediation. Mitigation and adaptation to global changes.
- Large benefits are possible from attention to environmental factors, e.g. asthma prevention, disease vectors and epidemiology. Benefits need to be quantified. This is of particular interest and relevance to pandemics such as malaria in underdeveloped countries, potentially saving thousands of lives.

Summer heat in this false-color infrared image taken as part of the interagency Urban Heat Island Pilot Project (UHIPP), courtesy of NASA

Issues for the CSA:

- Contribute to and keep abreast of environmental health forecasts (using existing models and known parameters); prepare and deliver prospectuses for what space can do in anticipation or response.
- Steer space programs according to <u>real</u> risks and real cumulative health benefits, as befits steady long technical investment; don't focus primarily on threats that may have high emotional impact but are of low actual risk.
- Position space technology and the Canadian space program in people's minds, aggressively and realistically, as a first line contributor to (a) foresight & prediction, long-term maintenance of well-being, and prevention of factors of ill-health; (b) ongoing delivery of health services, and management of current health factors; (c) potentially capable and ready to respond in health emergencies.
- Make the full 'business case' for investment in space technology and space program contributions to all the above, showing the savings potential relative to the full and cumulative public and private costs of health programs. This connects not only to GDP but to holistic indicators of quality of life.

Related themes:
Disasters
Climate Change & Variability
Sustainable Water Resources
Weather
Coastal and Marine Ecosystems
North/Arctic
Great Lakes – St-Lawrence
Sustainable Agriculture
Biodiversity and Ecosystem Conservation
Group on Earth Observations (GEO)
Global Monitoring for Environment and Security (GMES)

References:

Background Information:
Canadian Environmental Protection Act: Health Canada and Environment Canada
http://www.hc-sc.gc.ca/english/iyh/environment/cepa_overview.html

Health Canada, Environmental Health
http://www.hc-sc.gc.ca/english/protection/environment.html

Latest update:
Canadian Institutes of Health Research http://www.cihr-irsc.gc.ca/index.shtml

World Health Organisation http://www.who.int/health_topics/environmental_health/en

National Institutes of Environmental Health Sciences http://www.niehs.nih.gov

Closer look:
MCMICHAEL A.J., CAMPBELL-LENDRUM D.H., CORVALÁN C.F., EBI K.L., GITHEKO A., SCHERAGA J.D., WOODWARD A., *Climate change and human health - risks and responses*, WHO 2003, p. 250 http://www.who.int/globalchange/publications/cchhbook/en/

Water for Health – Taking Charge, Report, WHO 2001
http://www.who.int/water_sanitation_health/takingcharge/en/

Ecosystem Approaches to Human Health, IDRC
http://web.idrc.ca/en/ev-3314-201-1-DO_TOPIC.html