

Sustainable Systems and Human Well-Being

Presentation at “Seeking Solutions: 2007 Environmental
Health Lecture Series”
sponsored by the Seattle Biotech Legacy Foundation

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University of British Columbia

A (Substantive) Definition of Sustainability

It requires the reconciliation of 3 imperatives:

- the **ecological imperative** is to remain within the biophysical carrying capacity of the planet
- the **economic imperative** is to ensure and maintain adequate material standards of living for all people
- the **social imperative** is to provide social structures and systems of governance that propagate and sustain the values people wish to live by

Figure 1: Dematerializing the Economy

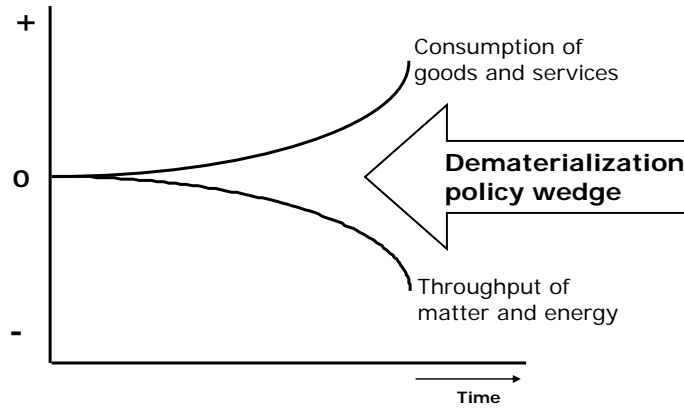
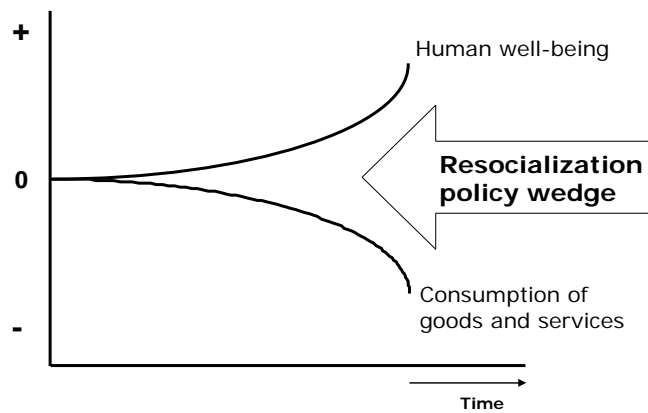
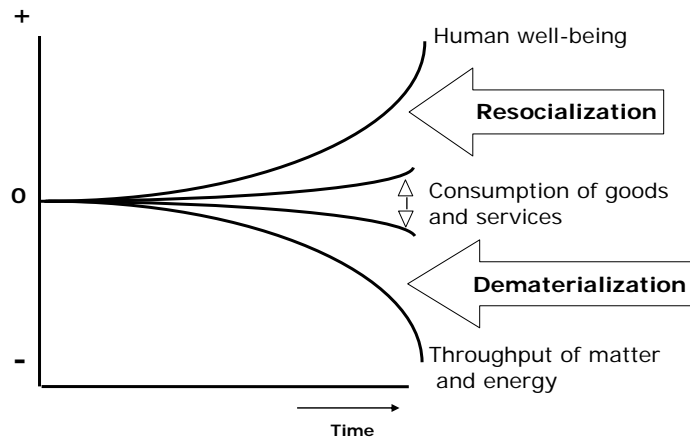


Figure 2: Resocializing Society



**Figure 3: Sustainable Development:
Combining the Policy Wedges.**



A (Procedural) Definition of Sustainability

- Sustainability is an emergent property of a discussion of desired futures . . .
- informed by some understanding of the ecological, social and economic consequences of . . .
- different courses of action

i.e. sustainability \approx desirability

Implications for Health and Well-being

- Both natural and human system health and well-being: integrated approach
- Are well-being implications on both ‘production’ and ‘consumption’ sides
- Crucial importance of collective dimensions (e.g. social determinants of health; ecosystem integrity)
- *i.e. Mens sana in corpore sano* applies both to individual and collective bodies (e.g. the body politic) and to both human and natural systems

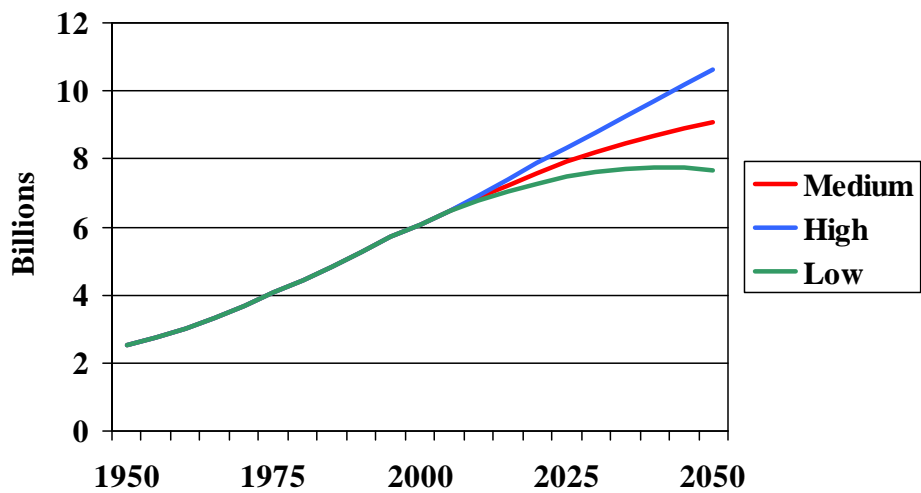
Centre for Interactive Research on Sustainability



CIRS Vision

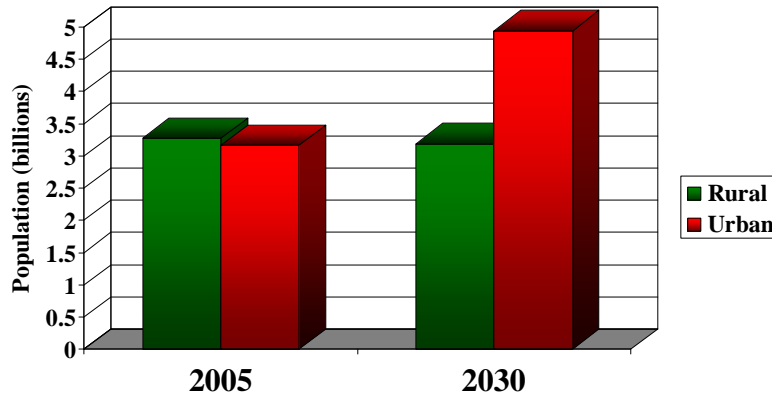
To be the most innovative and high performance building in North America and an internationally recognized leader in accelerating the adoption of sustainable building and urban development practices.

UN Global Population Projections



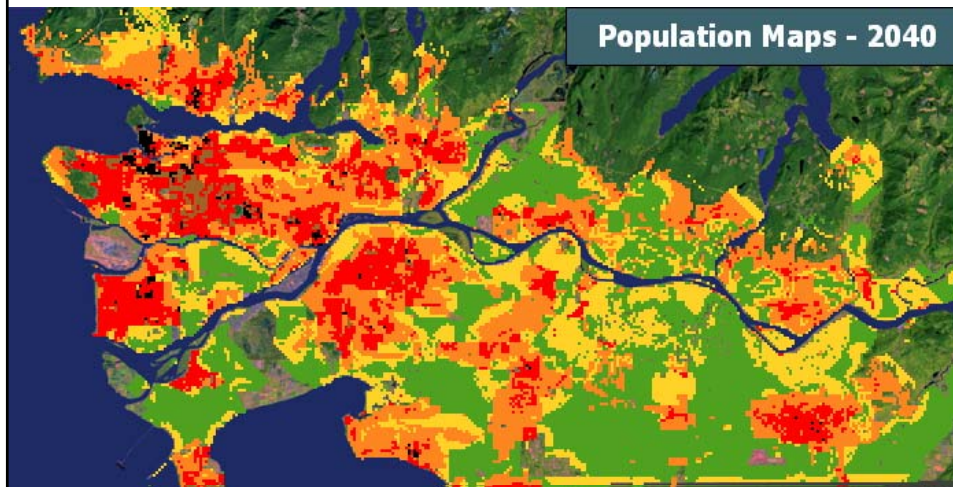
Source: UN (2005)

Rural-to-Urban Population Shift 2005 - 2030



Source: UN (2005)

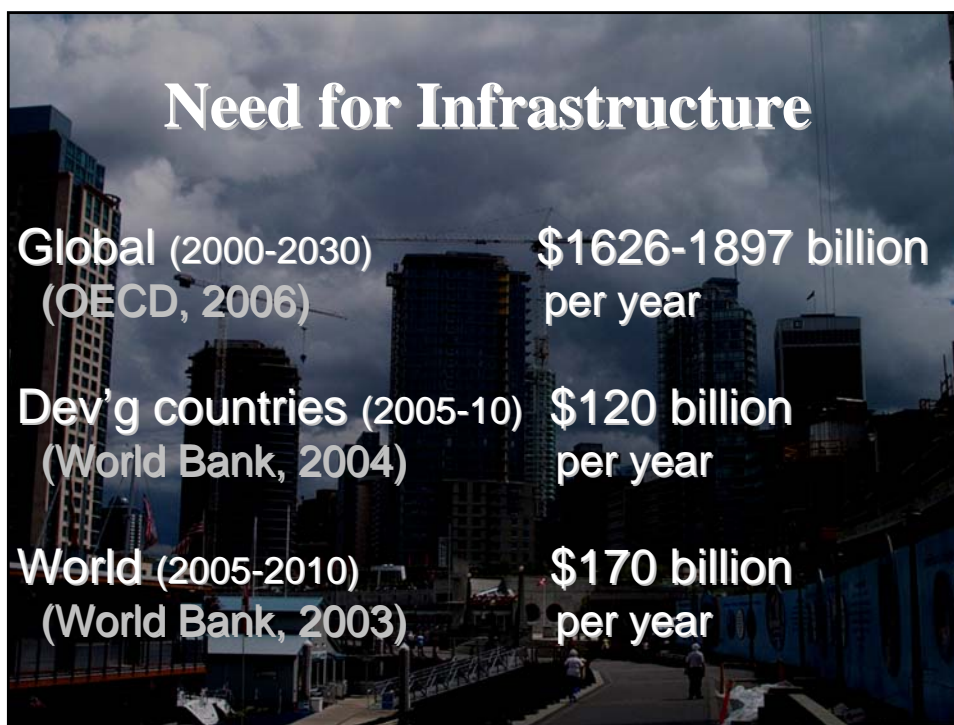
The Urban Tsunami



The Sustainable Development Imperative

10 challenges:

Clean air	Housing
Clean water	Jobs
Energy	Health care
Land use	Waste disposal
Transportation	Human Security



The CIRS Opportunity

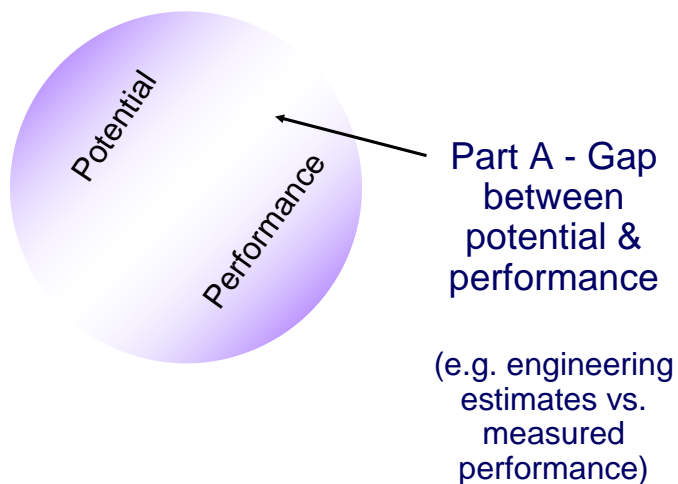
To make Canada a world leader in three interconnected fields of applied sustainability:

Part 1 - building design and operations

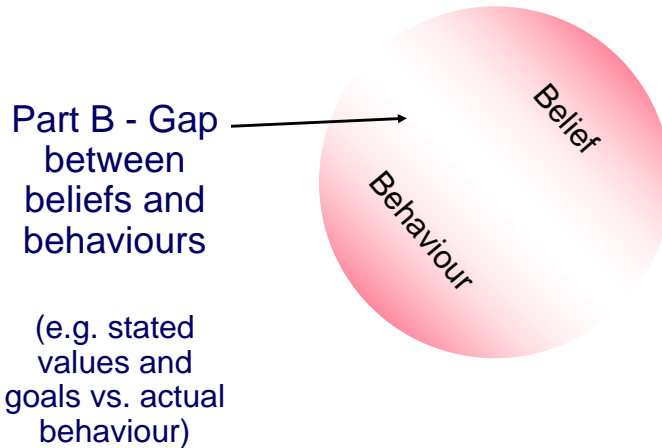
Part 2 - visualization, simulation and community engagement

Part 3 - partnerships and strategies of regional implementation

Addressing the gap between Intention & Action



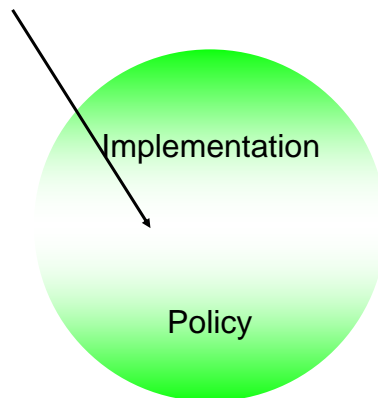
Addressing the gap between Intention & Action



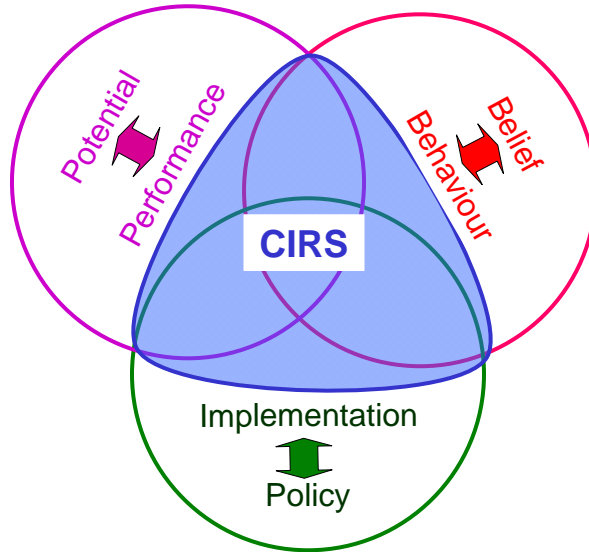
Addressing the gap between Intention & Action

Part C - Gap between policy and implementation

(e.g. federal climate change policy and actual GHG emissions)



Addressing the gap between Intention & Action



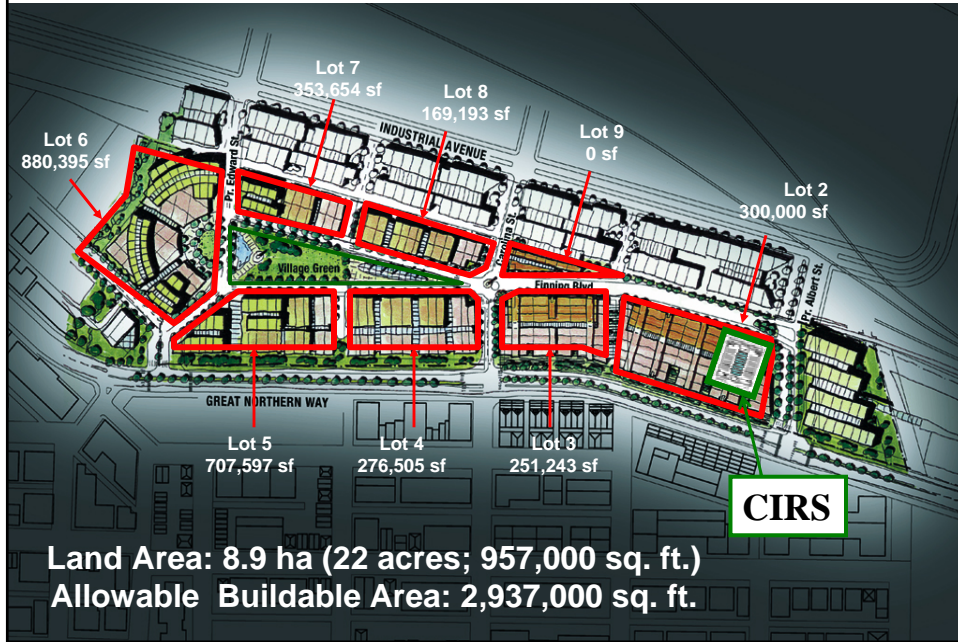
Great Northern Way Campus



“work together, with governments, businesses, agencies and the City of Vancouver, to build a unique and integrated centre of excellence in teaching/learning, research and entrepreneurship,”

- Two themes:
 - Urban Sustainability
 - Transforming Arts and Culture (incl. digital media)

Great Northern Way Campus



Great Northern Way Campus



The CIRS Research Program

Cluster A - Sustainable Building Design and Operation (**UBC, BCIT, ECIAD**)

Cluster B –Community Engagement Tools and Processes (**UBC, SFU, ECIAD, BCIT**)

Cluster C – Sustainability Implementation and Strategies (**SFU, UBC, BCIT, ECIAD**)

The Three Dimensions of CIRS

- 1. Building as Laboratory**
2. Simulation and Visualization
3. BC Showcase

Living within our means

- All heating and cooling from the ground
- All water from the sky
- All waste treatment from the ground and sun
- All light (when it exists) from the sun
- Virtually all electricity from the sun
- Virtually all ventilation from the wind

CIRS Sustainable Design Goals

- **Integrated and paperless design**
- **Sustainable mobility program**
- **Positive environmental impact**
- **GHG neutral**
- **Little mechanical ventilation/cooling**
- **Net energy producer***
- **100% daylighting**
- **100% rainwater**
- **Zero liquid waste**
- **Zero Solid Waste**
- **Sustainable building materials**
- **Healthy air quality**
- **Supermonitoring; adaptive controls**

Continuous research:
- technical
- behavioural

The CIRS Building Concept



The CIRS Building Concept



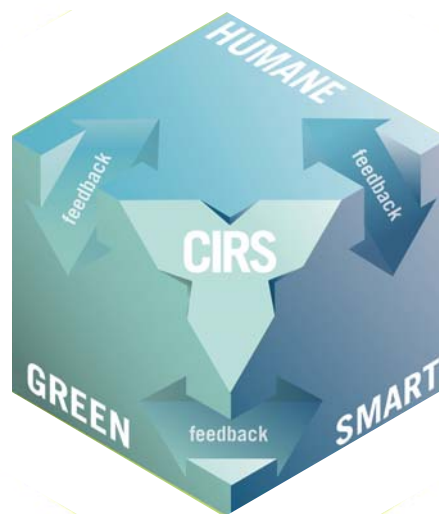
Improving the
Human Environment

The CIRS Building Concept

Cost-effective and
Adaptive

SMART

The CIRS Building Concept

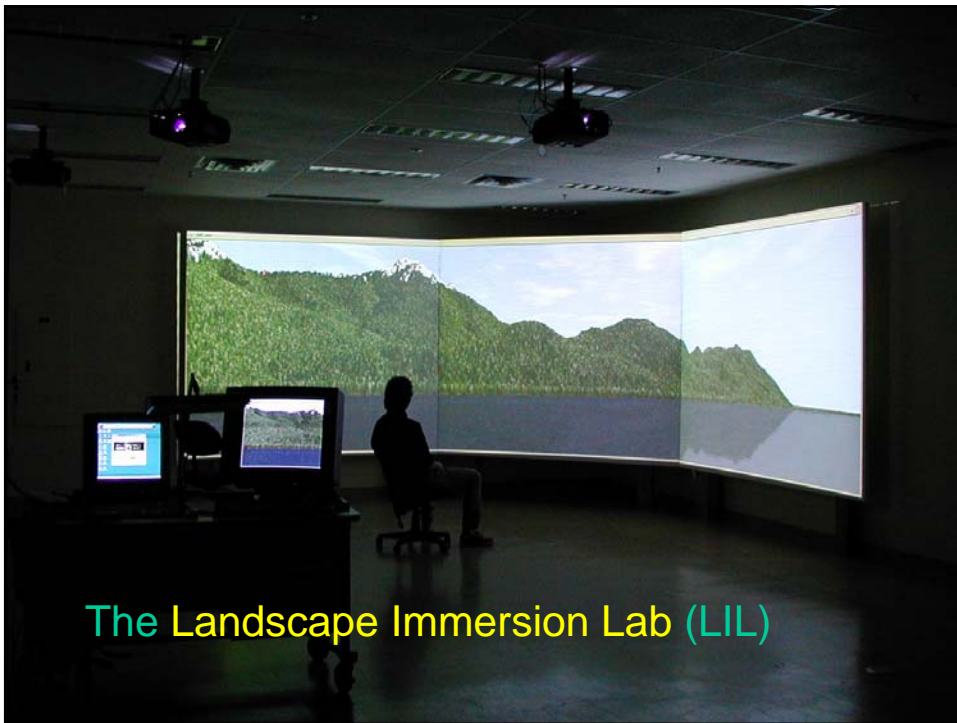
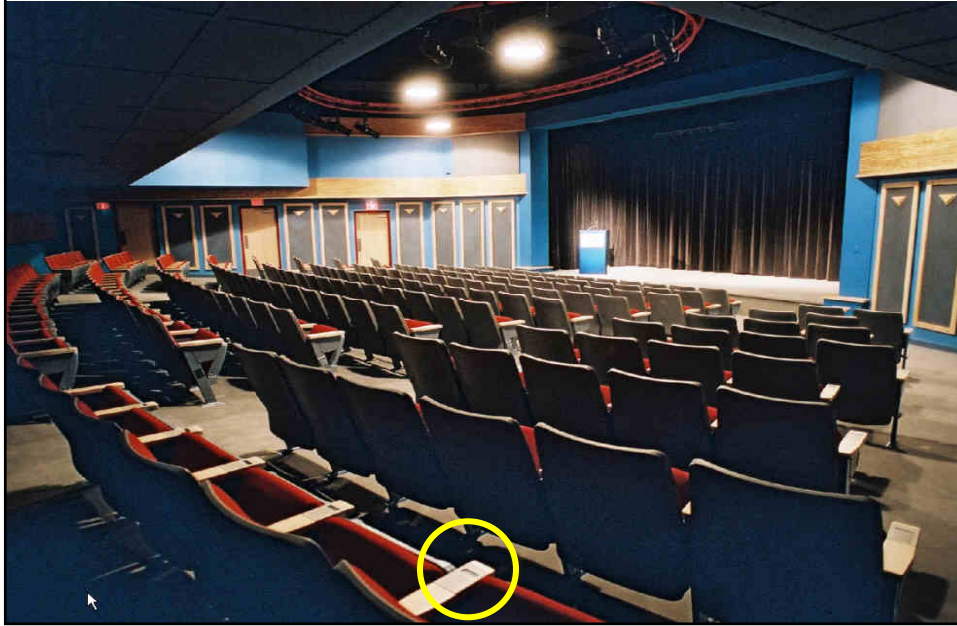




The Three Dimensions of CIRS

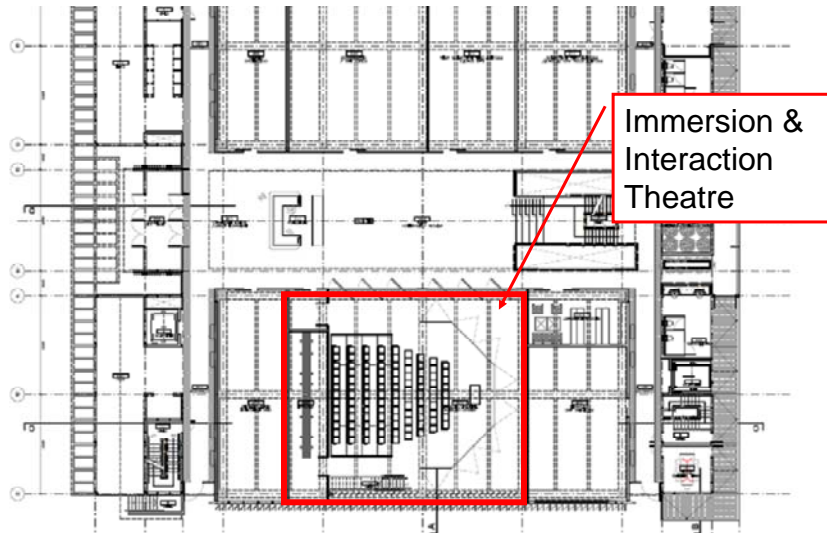
1. Building as Laboratory
- 2. Simulation and Visualization**
3. BC Showcase

Science World Theatre



The Landscape Immersion Lab (LIL)

Community Engagement



Programming at CIRS

- Valuation certificate
- Sustainability Trades Programming
- Community Service Learning
- University Courses

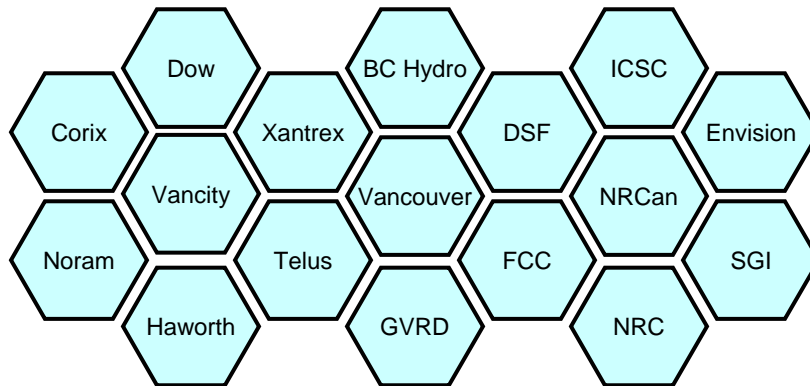
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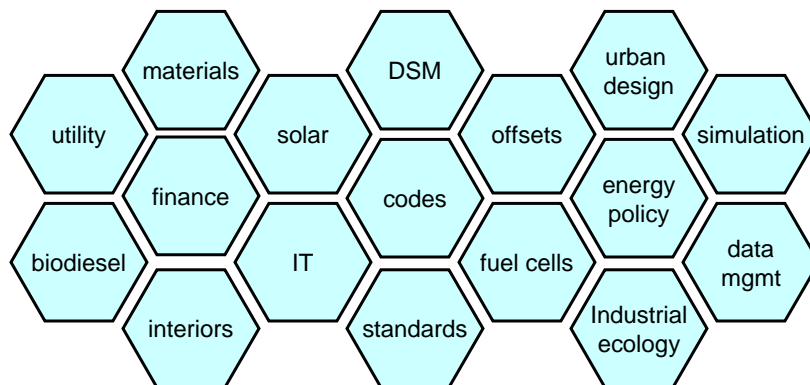
Showcasing Sustainable Development in BC

- Identify handful of areas of comparative advantage in SD in BC
- Create new forms of partnership to make them happen on the ground in this region: create Showcase
- Use Showcase as springboard for penetrating global market in SD technology and services

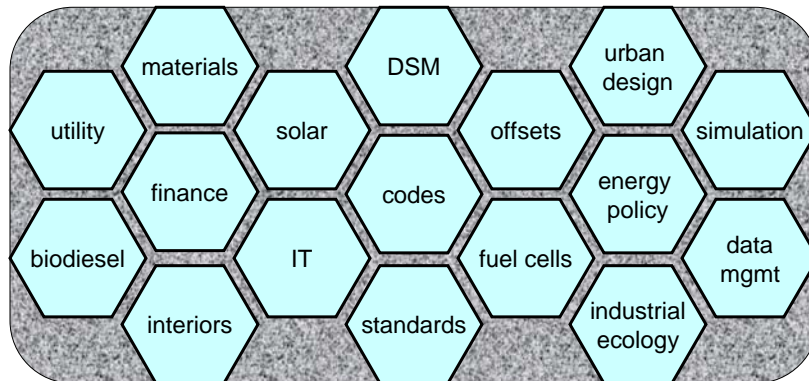
The Sustainability Mosaic



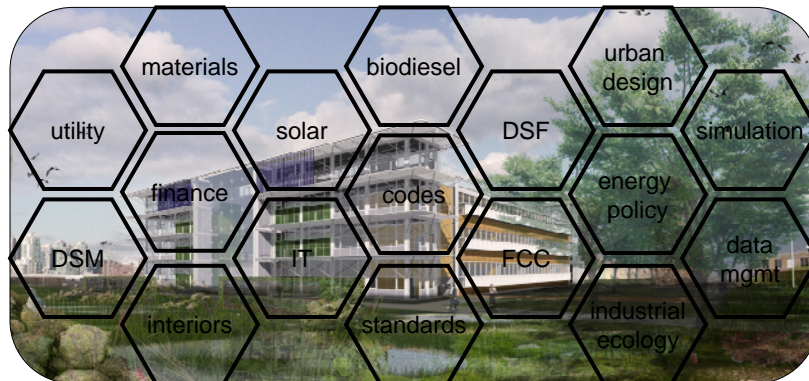
The Sustainability Mosaic



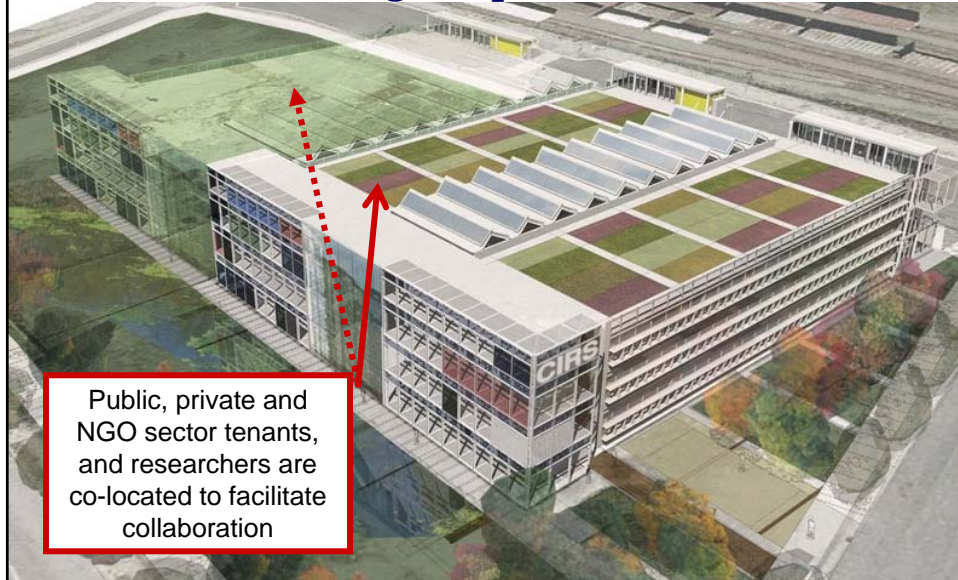
The Sustainability Mosaic



The Sustainability Mosaic



Partners share a common mission: *Accelerating SD practices in BC*

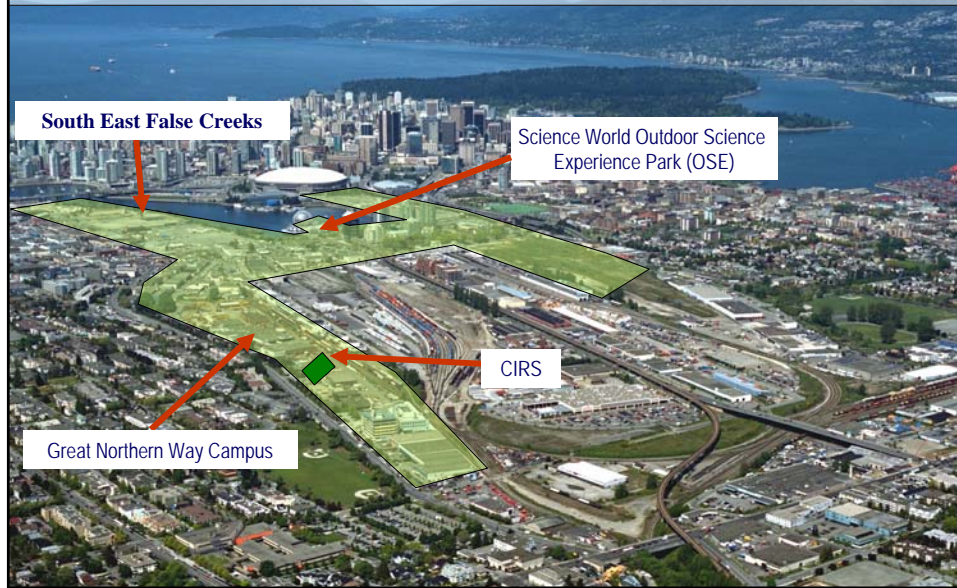


Prospective tenants

- UBC, BCIT, ECIAD, SFU (inter-institutional partners)
- BC Hydro*
- Terasen Utility Services*
- NRC – Institute for Fuel Cell Innovation*
- Fuel Cells Canada*
- Envision Sustainability Tools*
- International Centre for Sustainable Cities*
- Windmill Development
- VanCity
- Natural Resources Canada (Geological Survey of Canada)
- The City of Vancouver—Sustainability Group

* Signed non-binding letters of intent; others are under development

Vancouver Sustainability Precinct



City of Vancouver – Sustainability Precinct

- A multi-dimensional energy micro-grid system



- Multiple stakeholders involved in all sectors

- 500 acre downtown brownfield (several million square feet of development in next 10 years)
- Potential components:
 - District scale alternative heating grid with multiple distributed sources
 - Electricity micro-grid with multiple renewable and clean sources – including net-metering to grid for peak shaving
 - Municipal Utility Corporation to manage the system and expand it across city

Three Outcomes

- World leadership in three critical areas of sustainability research
 - Technology, behaviour, and policy/investment
- Real progress on sustainability in the region
 - Create ‘sustainability precinct’ in Vancouver
- Enormous export potential
 - Incubator for entering a trillion dollar market

BACKGROUND SLIDES

CIRS/GE Partnership?

Accelerating
Sustainability with
Ecomagination



CIRS Schedule

- Schematic Design Jan 2006
- Design Development Feb-Apr 06
- Design Charettes Feb-Apr 06
- Devel. Permit Application Mar 2006
- Working Drawings Nov06-Feb07*
- Excavation Feb 2007*
- Substantial Completion late 2008
- Occupancy late 2008
- Total Completion late 2009

* Require UBC Board of Governors approval

Estimated Project Cost

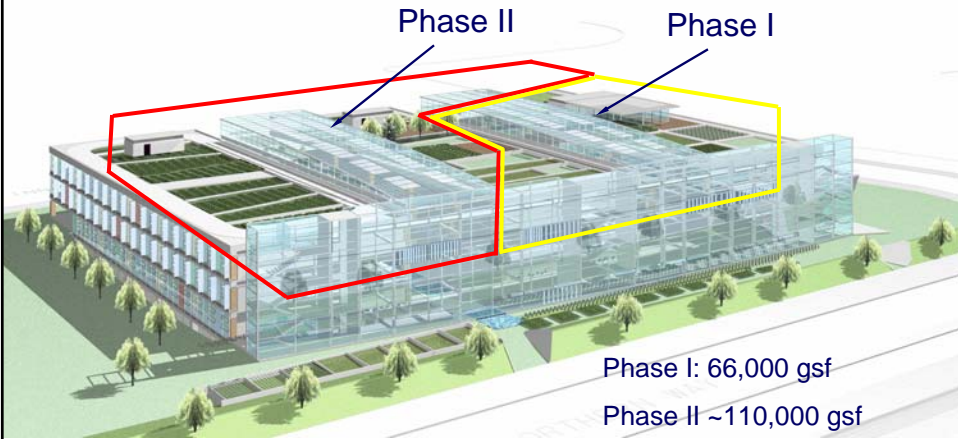
	Phase I (66,000gsf)	Phase I & II (~110,000gsf)
Building Design & Construction	\$ 29.5m	~ \$ 41.5m
Other soft costs & equipment	\$ 6.3m	~\$ 10.4m
Land Acquisition	\$ 2.3m	~\$ 3.4m
TOTAL	\$38.1m	~\$55.3m

Types of Partnership

- Testing of building technologies and systems
- Training and certification
- Collaborative research
- Tenancy
- Membership
- Sponsorship
- Philanthropy

Strategic
Alliance

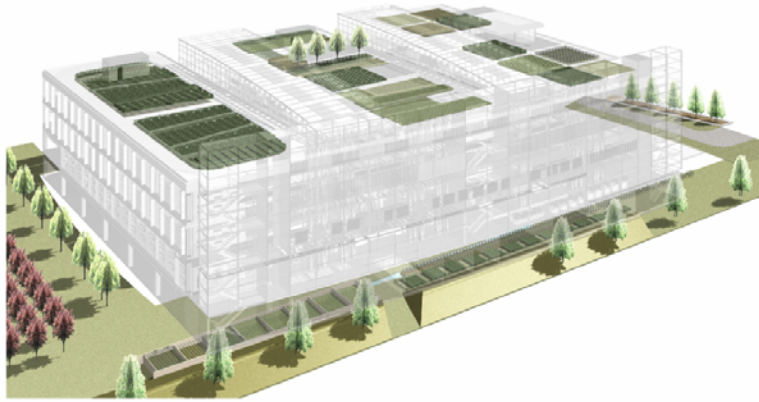
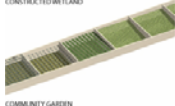
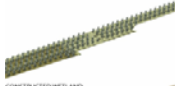
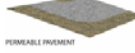
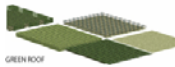
Modular Design



Site systems

- Neutralize ecological and microclimatic disturbance to the site
- Increase the net amount of biomass & oxygen produced on site
- Restore habitats for local fauna

SYSTEM COMPONENTS



CIRS Energy Systems

- GHG neutral; green energy supply
- integrated energy system; ultra-low energy use
- net energy generator; hybrid micro-utility

SYSTEM COMPONENTS



BUILDING-INTegrated PHOTOVOLTAIC PANELS



FUEL CELLS + COGENERATION PLANT



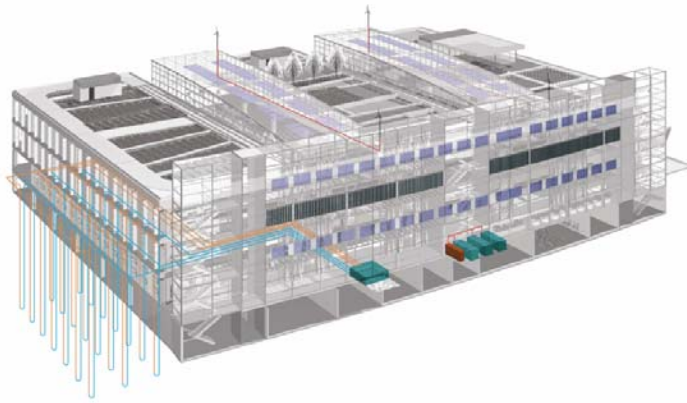
SOLAR HOTWATER COLLECTORS



GROUND SOURCE HEATPUMPS



MICRO WIND TURBINES



Structural systems

- Eliminate solid waste stream leaving the site
- Maximize building utilization
- Procure resource efficient building materials & furniture systems

SYSTEM COMPONENTS



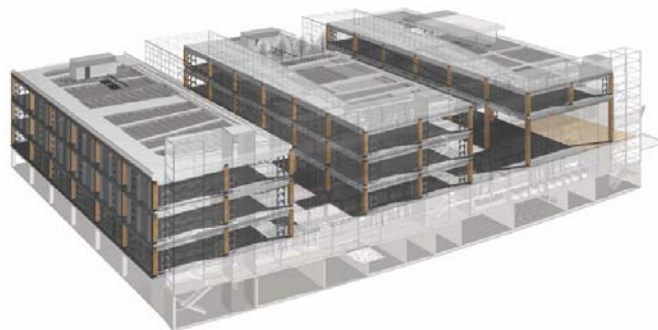
PRE-CAST CONCRETE HOLLOW CORE SLAB



WOOD / STEEL COLUMN

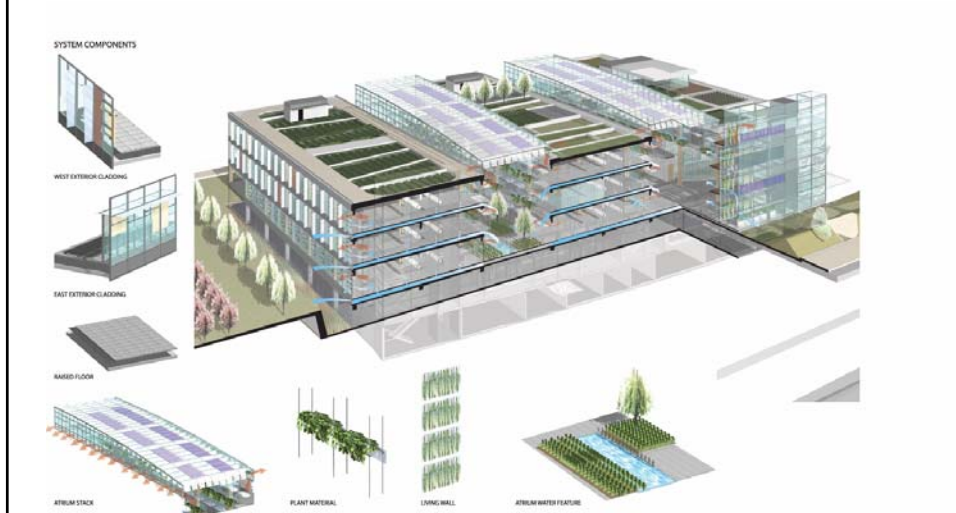


SHEAR PANEL



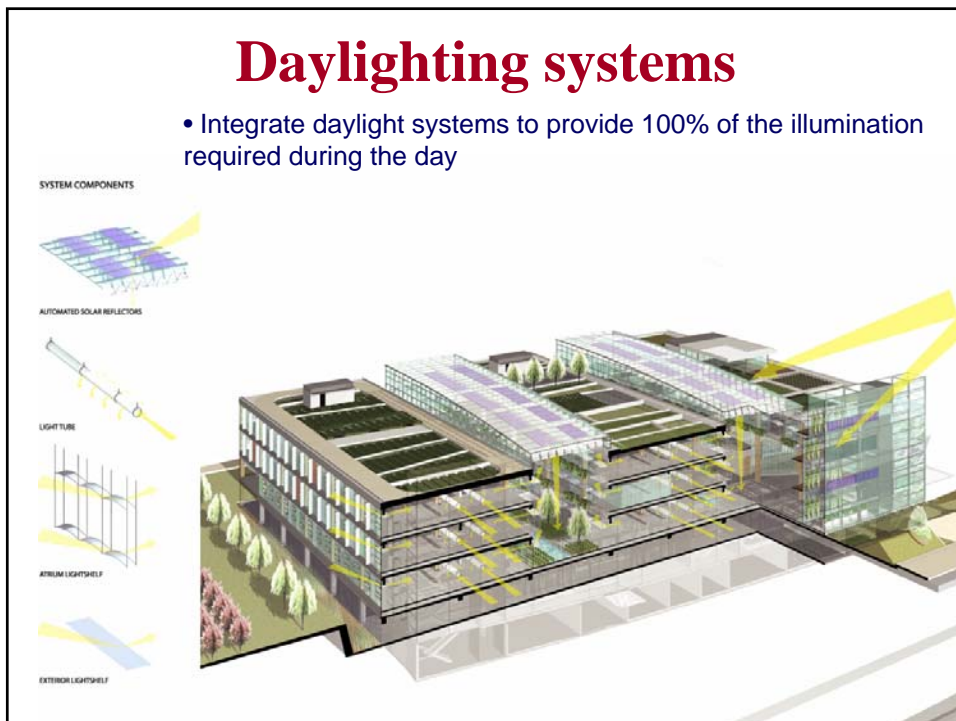
Ventilation systems

- Maximize natural ventilation
- Minimize mechanical cooling requirements



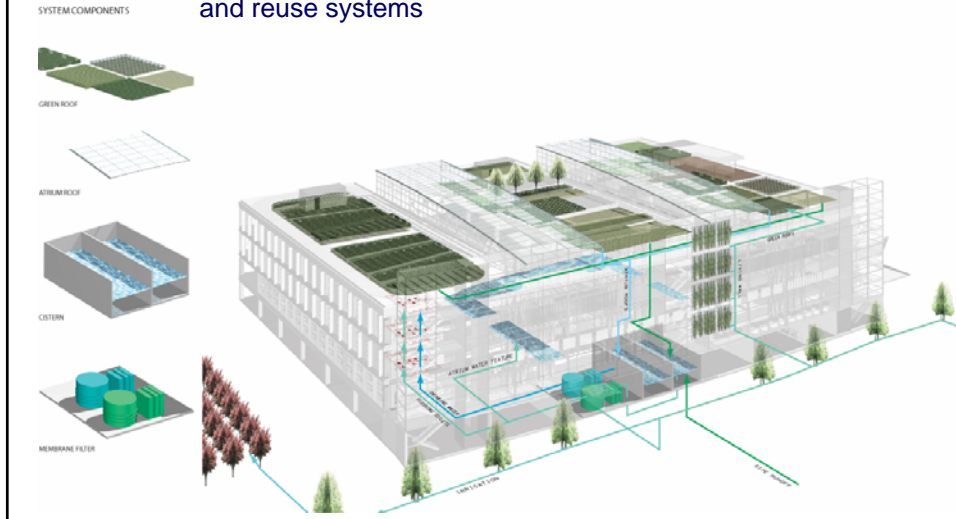
Daylighting systems

- Integrate daylight systems to provide 100% of the illumination required during the day



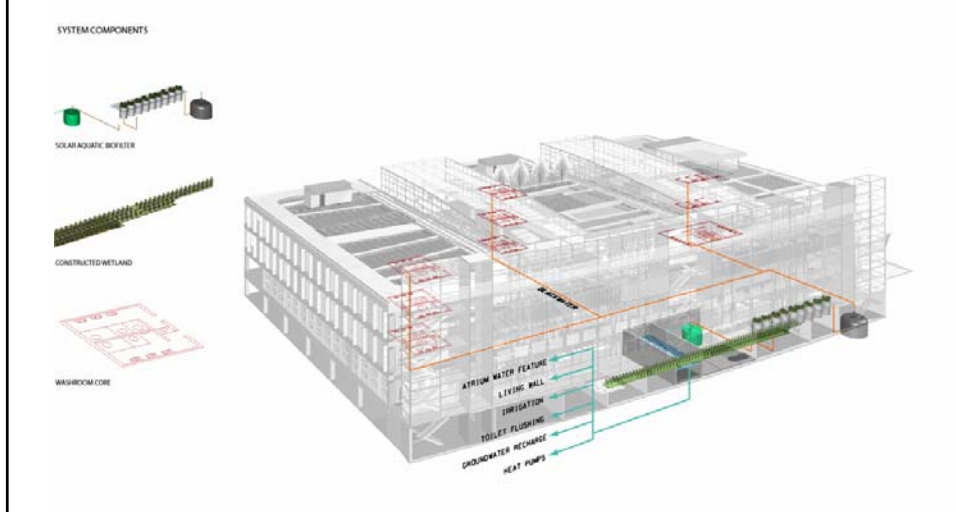
Rain Capture systems

- Rainwater collection for potable water supplies
- Eliminate storm-water run-off from the site through treatment and reuse systems



Wastewater systems

- Treat and reuse all wastewater generated on-site



Other systems



Health + Well-Being

- Daylighting for productivity
- Indoor and outdoor oxygenation
- Healthy design

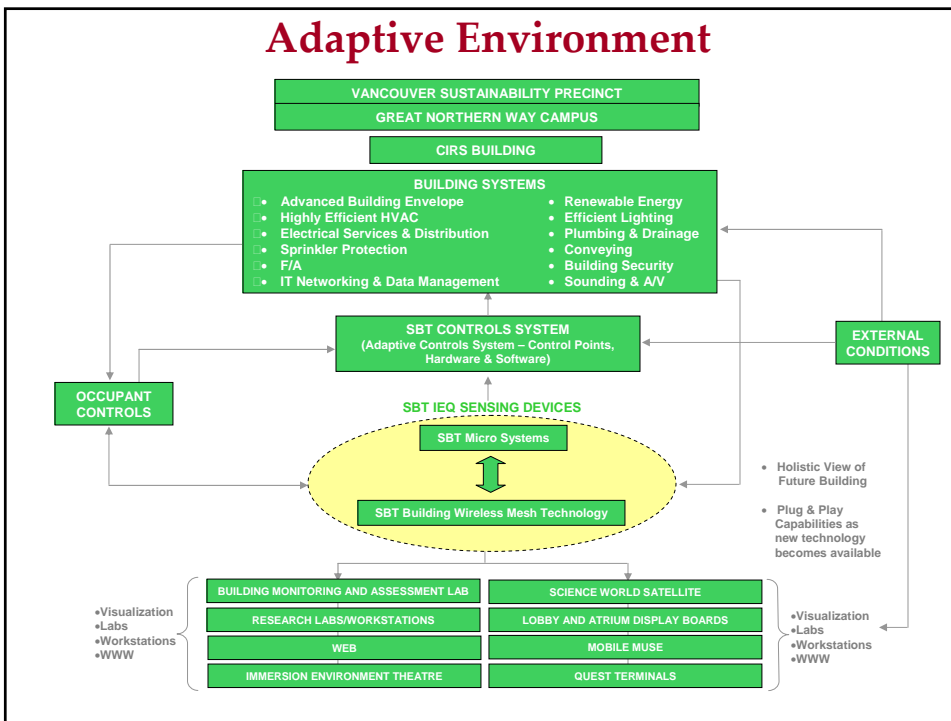
Building Operations + Maintenance

- 1000 points of monitoring
- Integrated design and maintenance

Sustainable Community

- Local product and service procurement
- Sustainable mobility co-op
- Community education and outreach programs
- Hydrogen and electric vehicle refueling stations

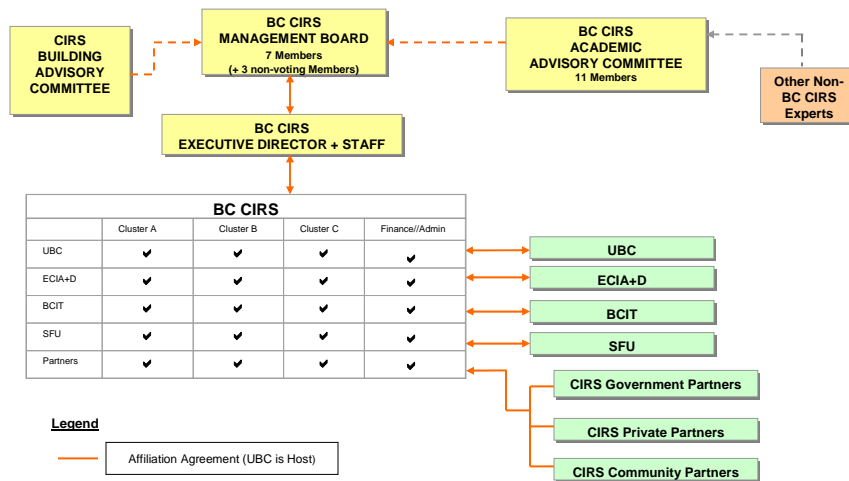
Adaptive Environment



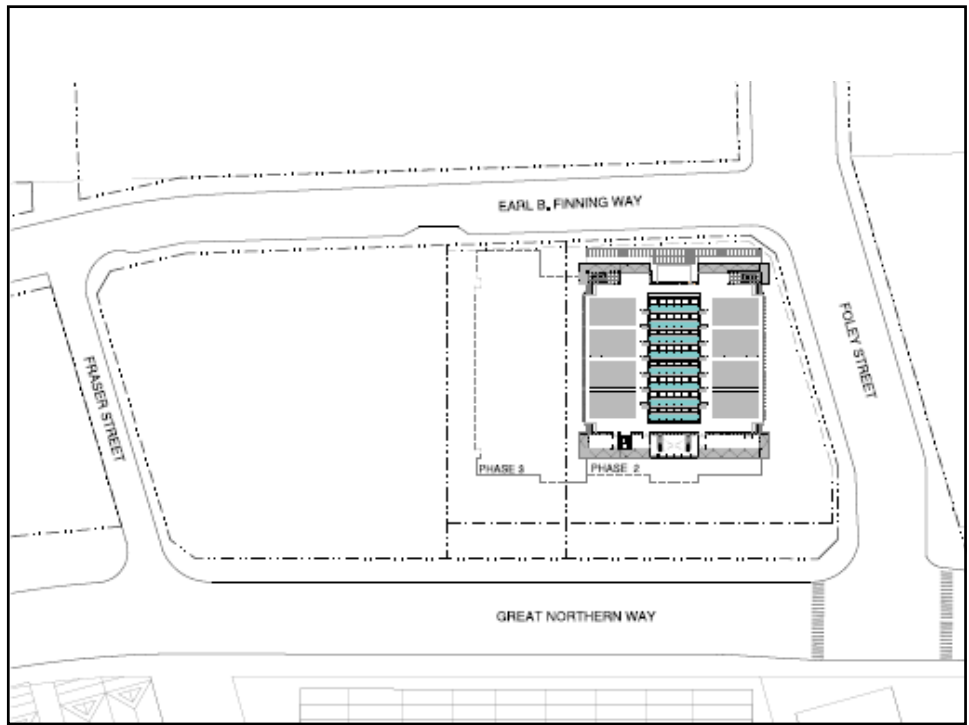
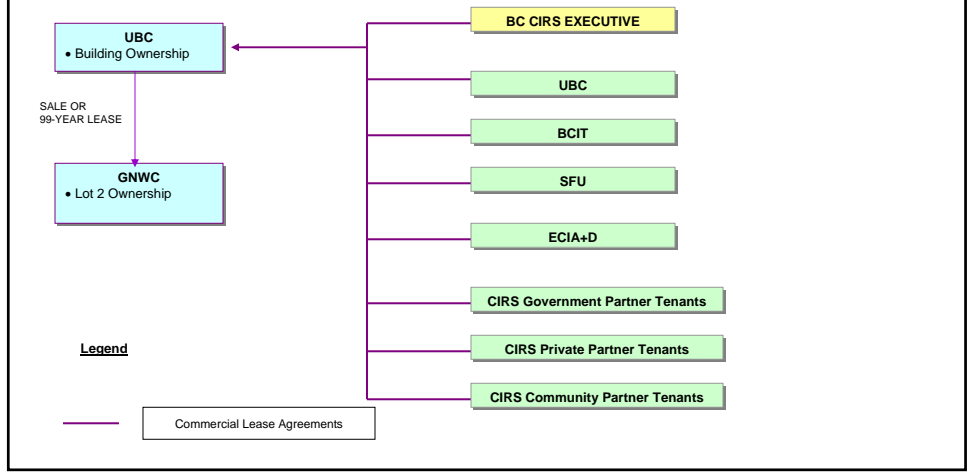
CIRS Location & Skytrain Station



Proposed Governance Structure - Affiliation

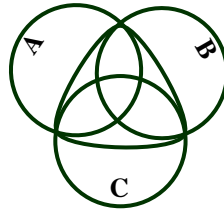


Proposed Governance Structure – Building and Land



CIRS Research Program

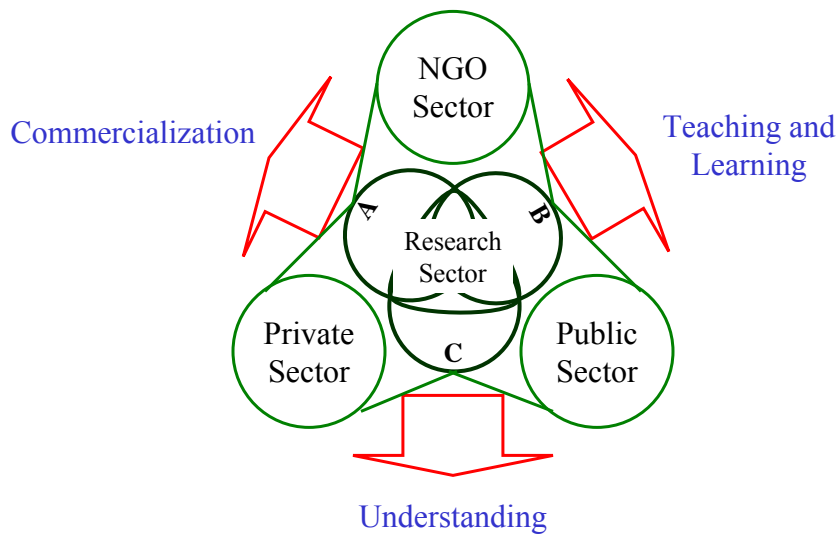
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Cluster B – Tools and Processes for Community Engagement (**UBC, SFU, ECIAD, BCIT**)

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CIRS Partnerships & Outcomes



Alternative visualizations



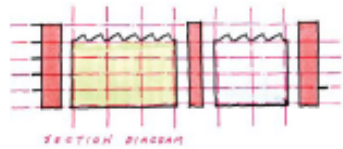
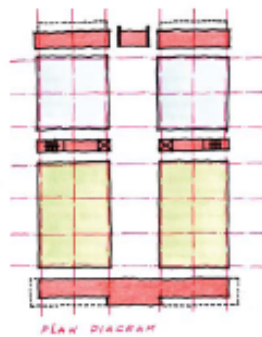
Alternative visualizations



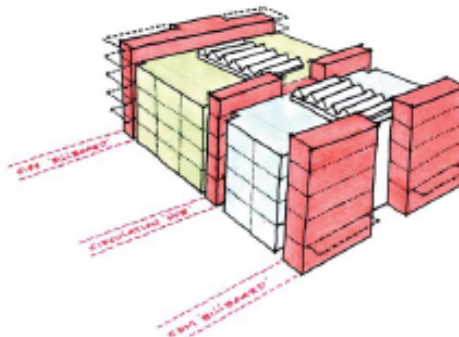
Alternative visualizations



Centre for Interactive Research on Sustainability and Digital Media (CIRSDM)



4 Storey Option
NTS



CIRSDM Gross Area	5,925 m ²	63,755 ft ²
CDM Gross Area	4,215 m ²	45,370 ft ²
Total Gross Area	10,140 m ²	109,125 ft ²
FSR (with greenway)	10,140 / 5218 = 1.95	
FSR (without greenway)	10,140 / 4604 = 2.20	

