

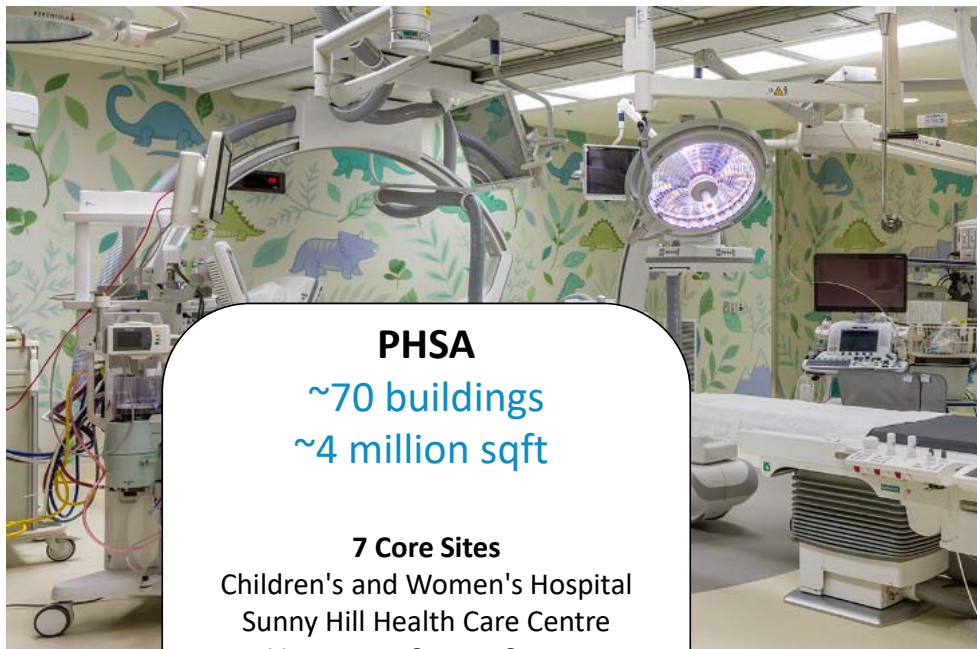
8th Annual Public-Sector Climate Leadership Symposium: *Green Buildings in Healthcare*

Alex Hutton, Energy Manager

November 26th, 2019



Context



~30 buildings
~2 million sqft

7 Core Sites
St. Paul's Hospital
Mount Saint Joseph Hospital
Holy Family Hospital
Youville Residence
St. Vincent's: Brock Fahrni
St. Vincent's: Langara
St. Vincent's: Honoria Conway
Coming soon: New SPH

All Leased Sites

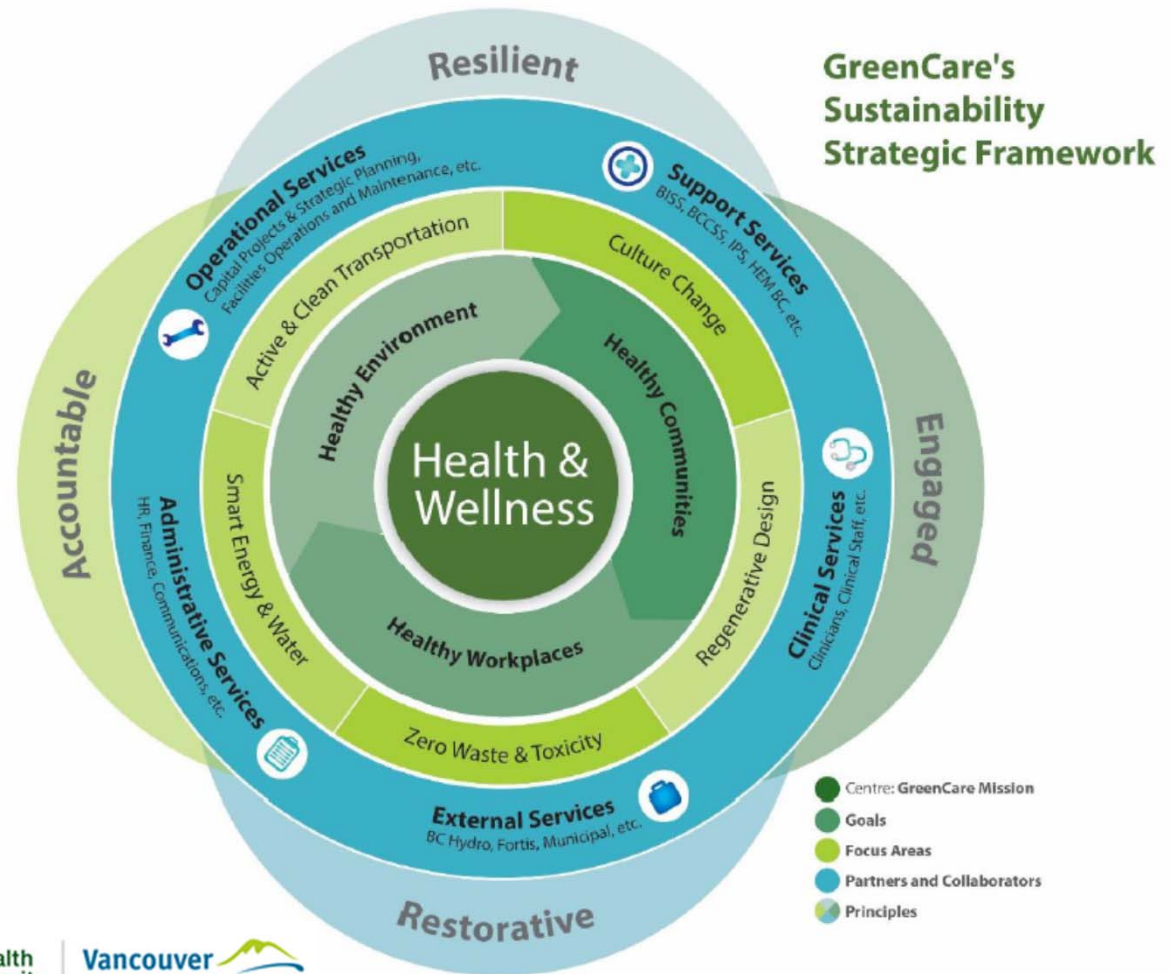
PHSA
~70 buildings
~4 million sqft

7 Core Sites
Children's and Women's Hospital
Sunny Hill Health Care Centre
Vancouver Cancer Centre
Cancer Research Centre
BCCA - Vancouver Island Centre
BCCA - Fraser Valley Centre
Cancer Centre for the North

All Leased Sites

Context

GreenCare Vision:
Transforming Health Care
for a Thriving Environment



<https://bcgreencare.ca/>

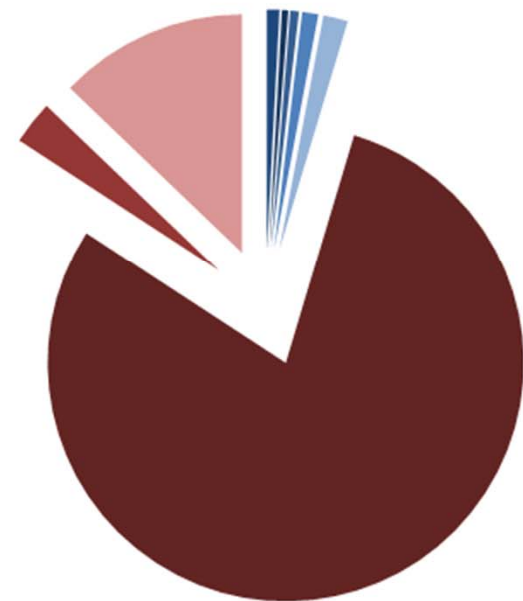
Typical End Use Breakdown - Healthcare

Energy Use Intensity

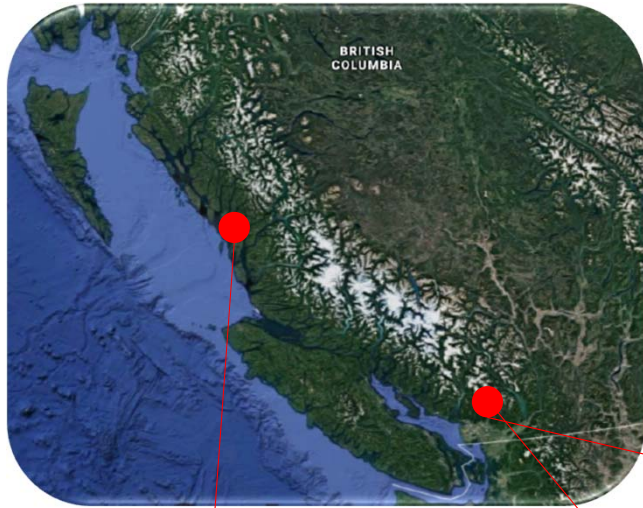


- Lighting
- Cooling & Heat Rejection
- Pumps
- Fans
- Plug & Process Equip't
- Heating - Fuel
- Service Hot Water - Fuel
- Process Heating - Fuel

Carbon Intensity



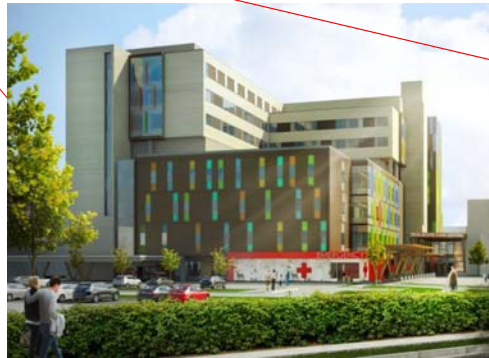
Source: From study of end use metering results of Salmon Creek Medical Centre, Vancouver, WA
<https://facilityexecutive.com/2011/11/vancouver-wa-hospital-studied-for-energy-practices/>



BRITISH
COLUMBIA



Bella Bella Staff Housing Complex
(Vancouver Coastal Health)



Teck Acute Care facility (PHSA)



SPH Chiller 2 & Heat Recovery
Project (PHC)

Bella Bella Staff Housing Project

Designed to meet Passive House Standard

Six 1-bedroom residential units

Floor area: 500 m²

Cost: \$2.6 Million (20 to 40% savings over on-site construction)

Energy Use Intensity: 67 kWh/m²/year

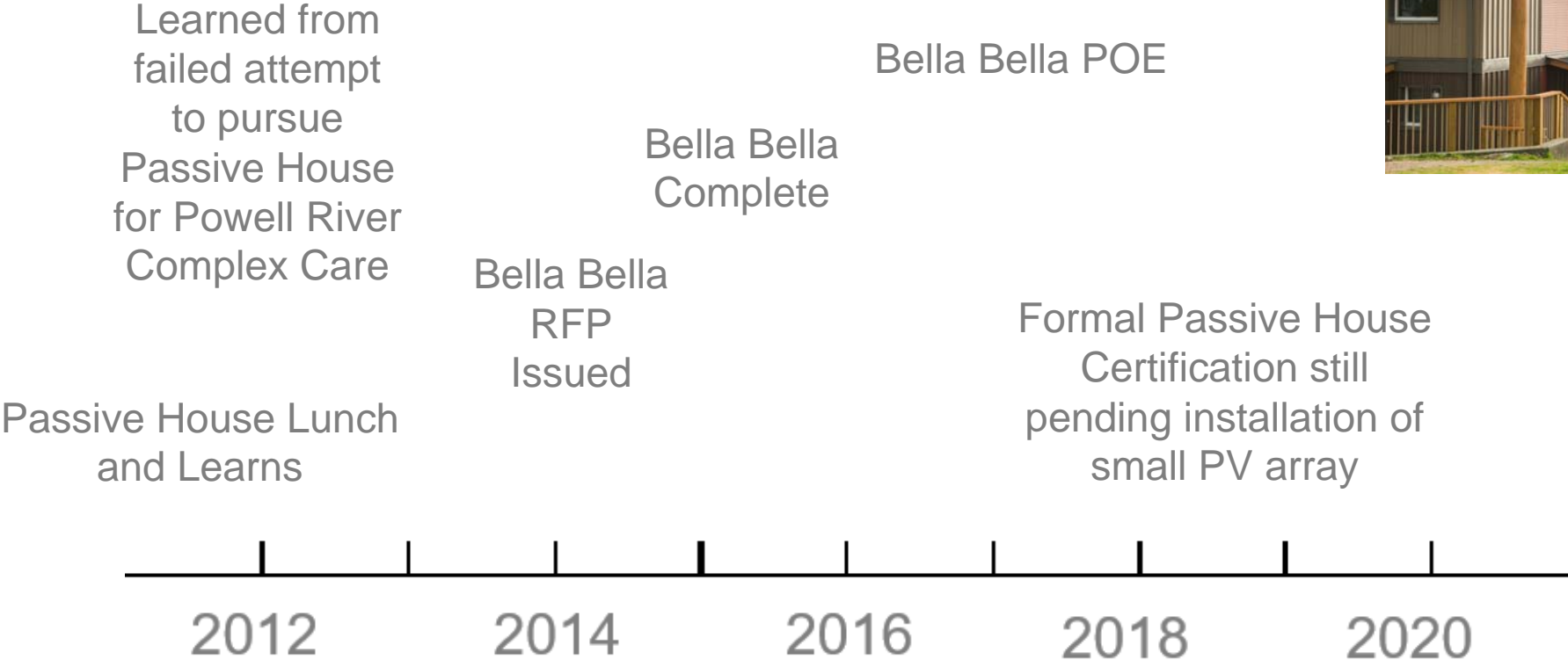
Carbon Intensity: **0.7 kgCO₂e/m²/year**



See Case Study for more info:

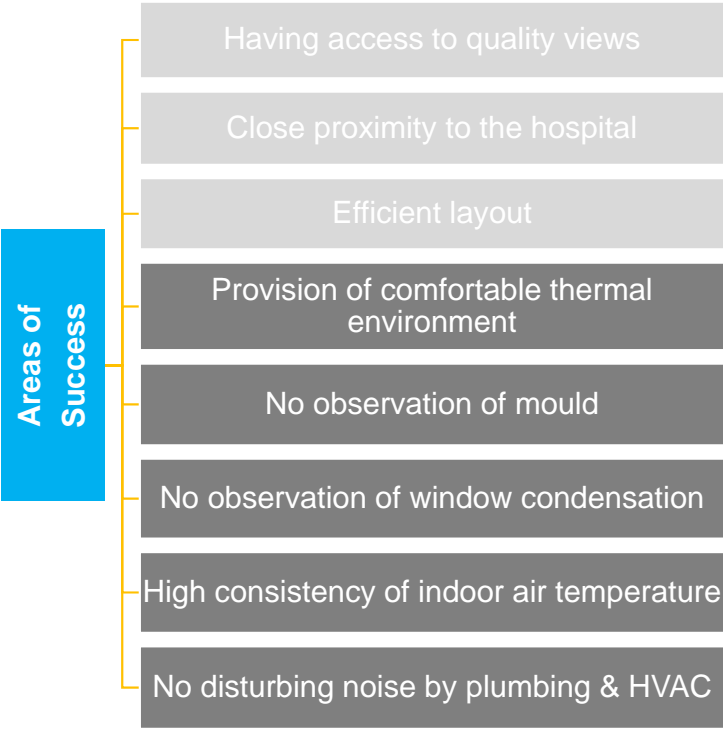
<https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/resources/case-studies/cng-casestudies-bella.pdf>

Bella Bella Timeline



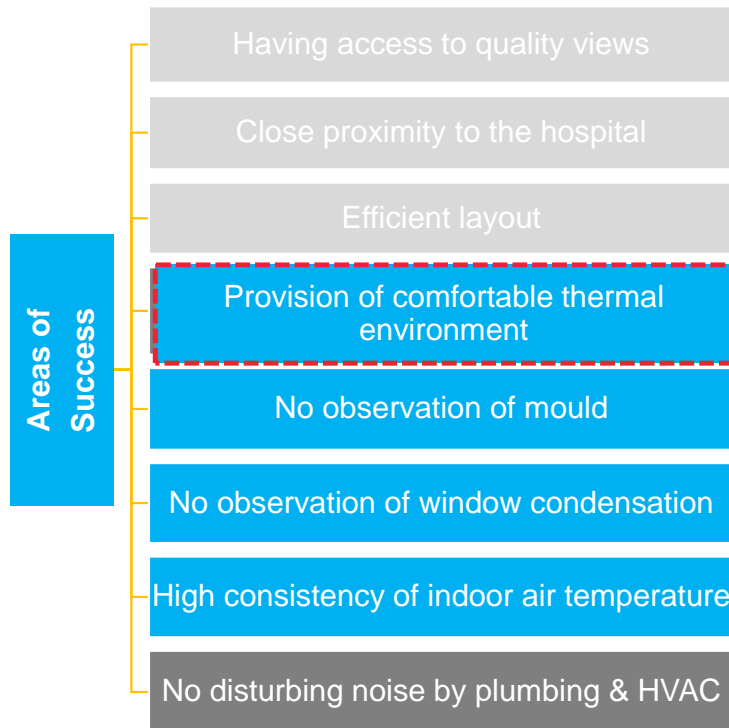
Highlights of Key Findings

Post Occupancy Evaluation of a PH residential facility in northern, BC

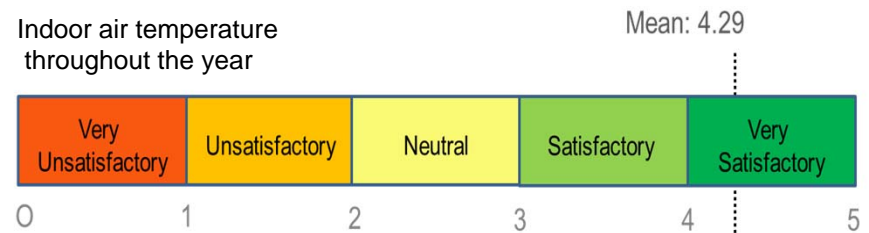


Highlights of Key Findings

Post Occupancy Evaluation of a PH residential facility in northern, BC



Indoor air temperature throughout the year



*“This building is one of the **most comfortable places** I have ever lived in. **The temperature is always good....I get cold very easily but this building never gets cold...**”*

A building occupant

ASHRAE Event: Dr. Stephanie Taylor: Putting People First; Managing Indoor Environment for Human Health

Her research shows that maintaining **indoor relative humidity between 40% and 60%** was the single greatest determinant of occupant health

See Dr. Taylor's website for more info:
<http://www.taylorcx.com/>



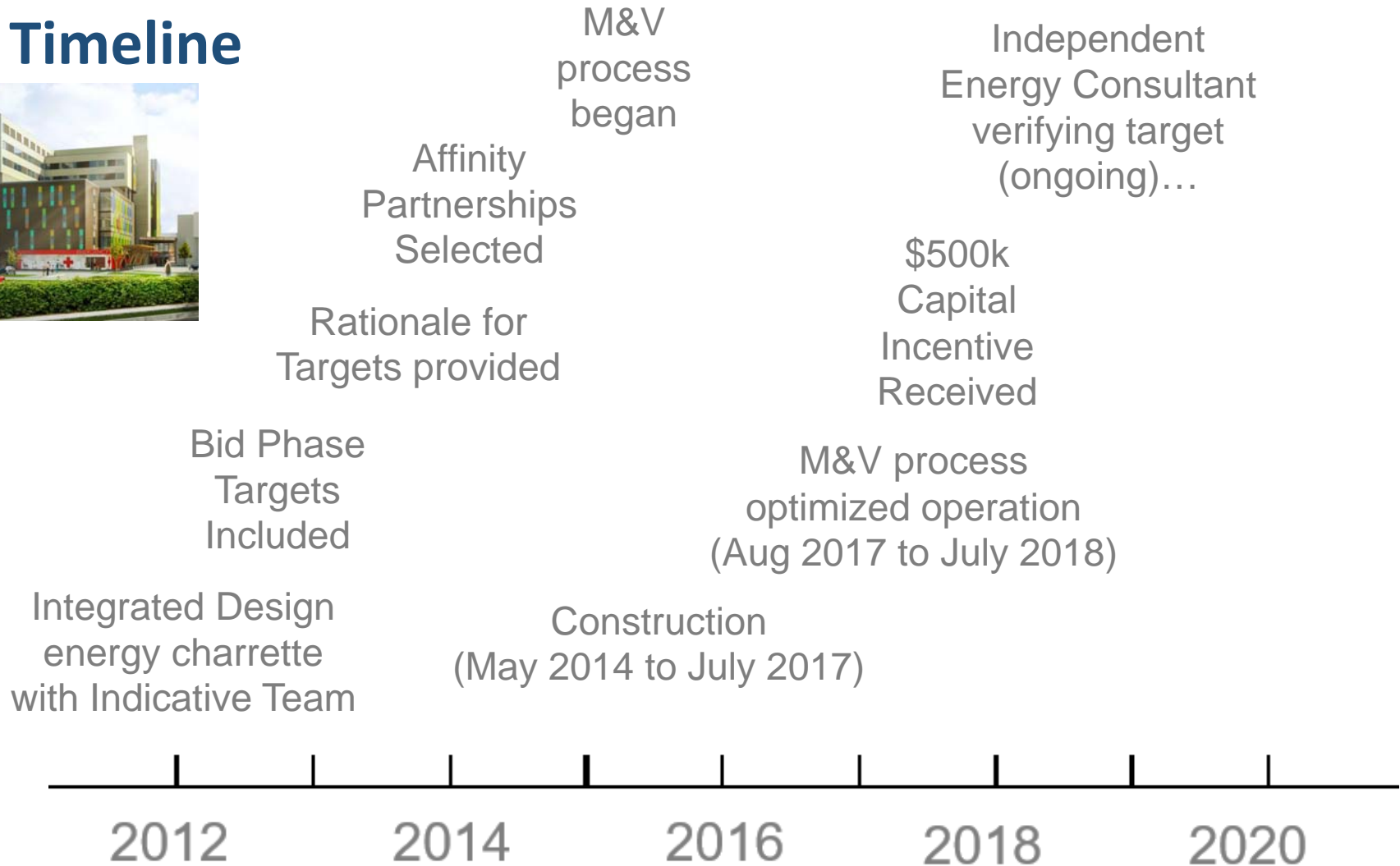
Teck Acute Care Centre (TACC)

- New Acute Care Facility
- Goals focused on patient and family-centred care
 - Strategies to create **healing environments**
 - Daylighting
 - Views of nature
 - Wellness walkway
 - etc.



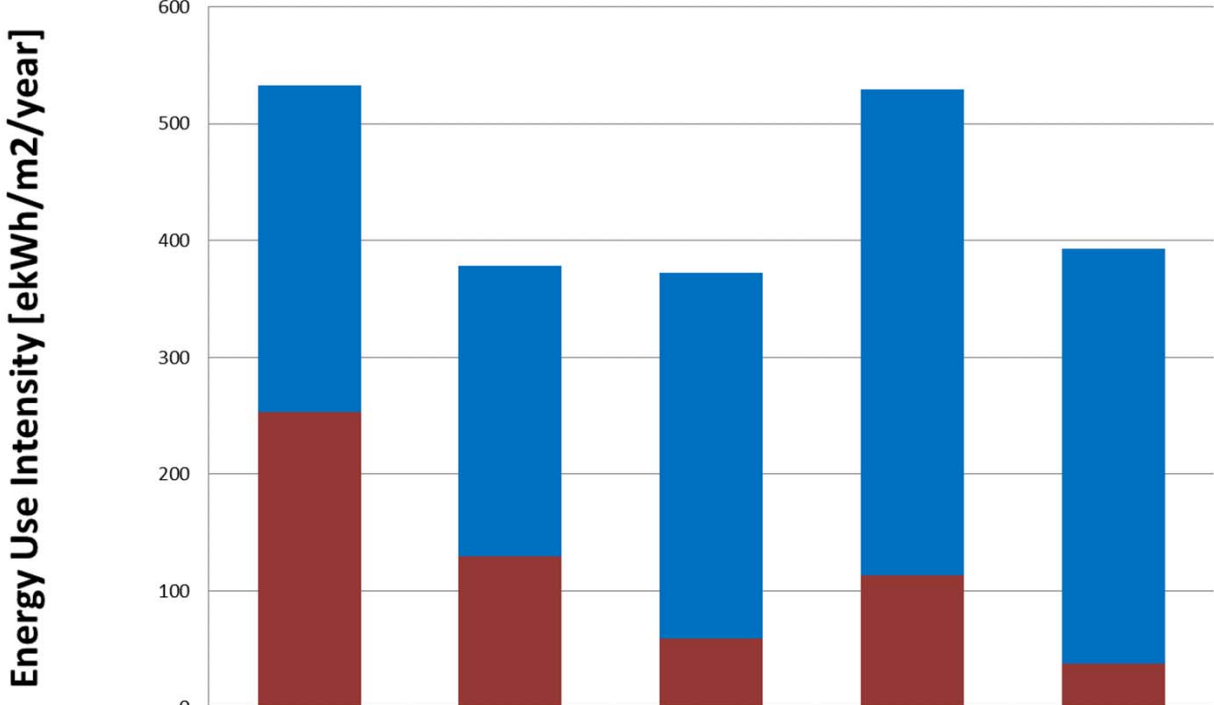
Video about project available:
<https://youtu.be/Uih7zVi62hY>

TACC Timeline



TACC Results

Energy Use Intensity for TACC Building (ekWh/m²/year)



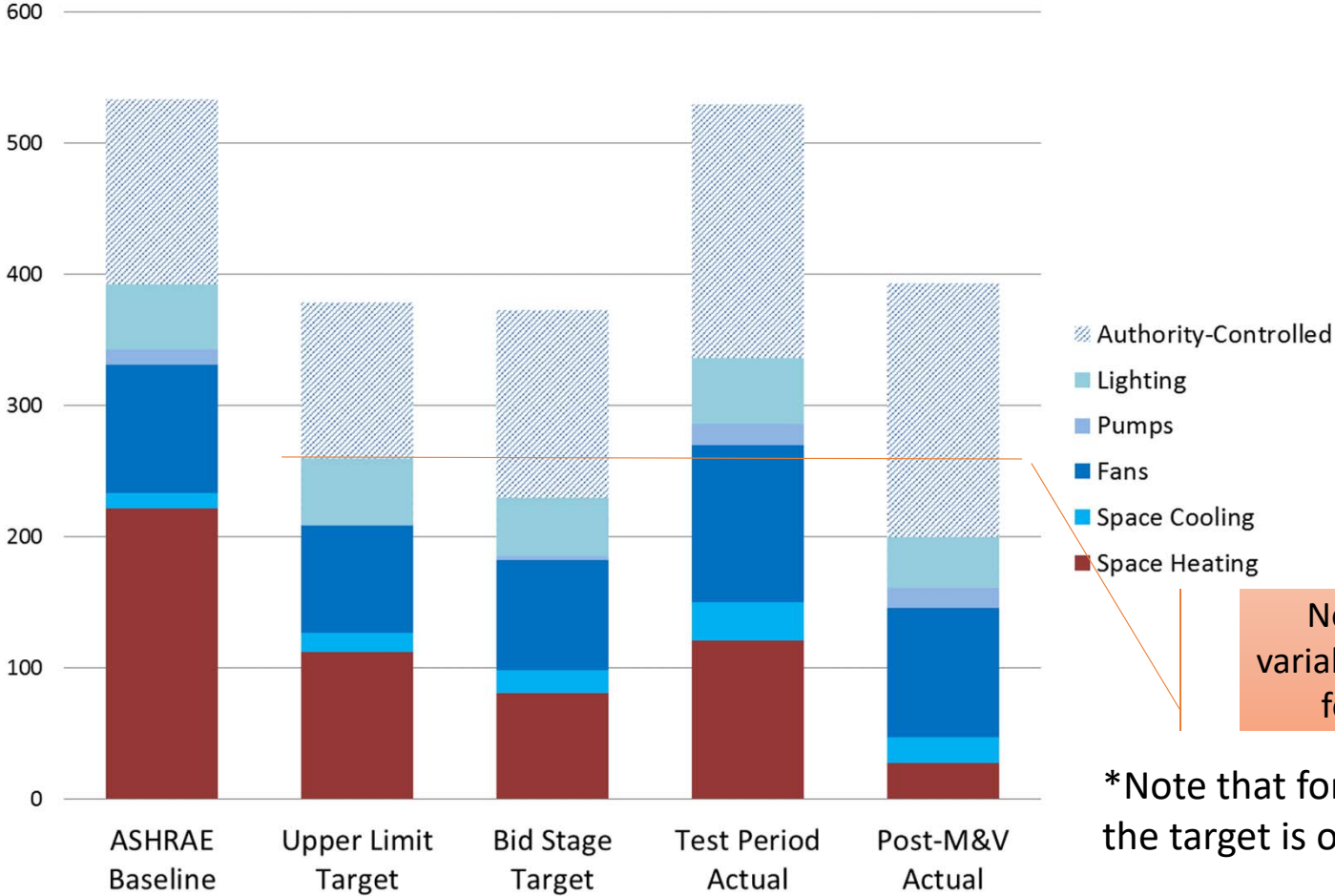
	ASHRAE Baseline	Upper Limit Target	Bid Stage Target	Test Period Actual	Post-M&V Actual
TOTAL	533	378	373	529	393
■ Energy from Electricity	280	249	314	416	356
■ Energy from fossil fuels	253	129	59	113	38



*Note that EUI is based on conditioned floor area

TACC Results

Energy Use Intensity for TACC Building (ekWh/m2/year)



Note that Authority-Controlled variables will be accounted for during formal comparison to targets

*Note that formalized comparison to the target is ongoing.

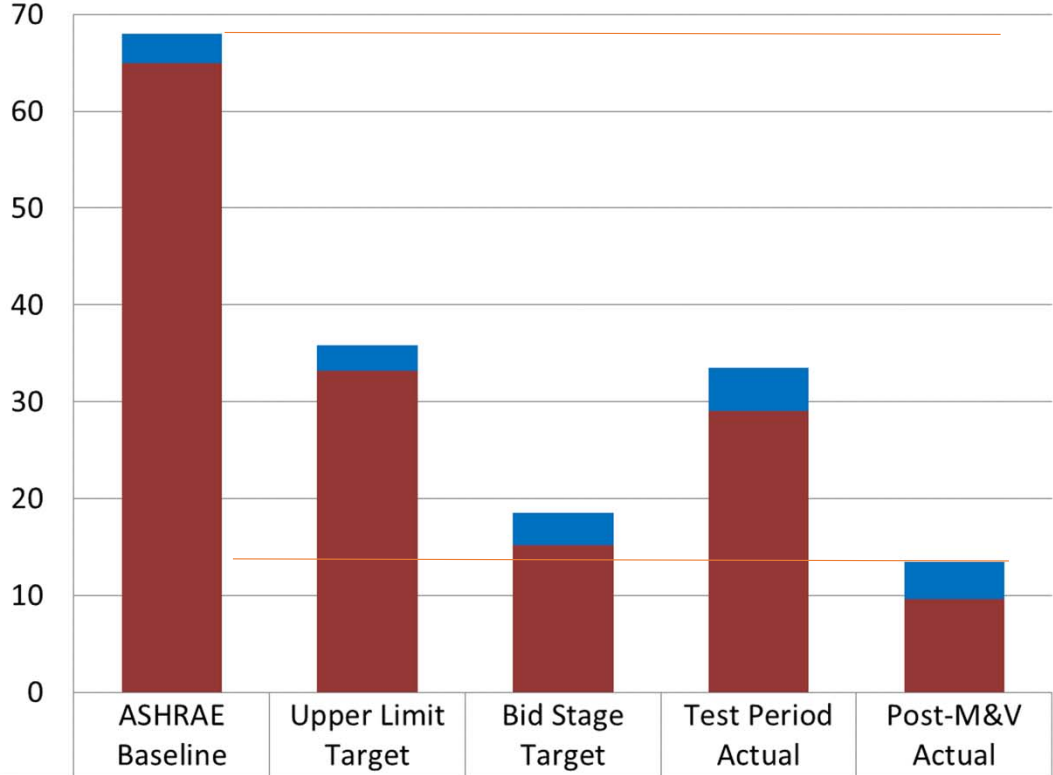


TACC Results



Carbon Emissions Intensity for TACC Building (kgCO₂e/m²/year)

Carbon Emissions Intensity [kgCO₂e/m²/year]



~80% operational carbon reduction relative to ASHRAE

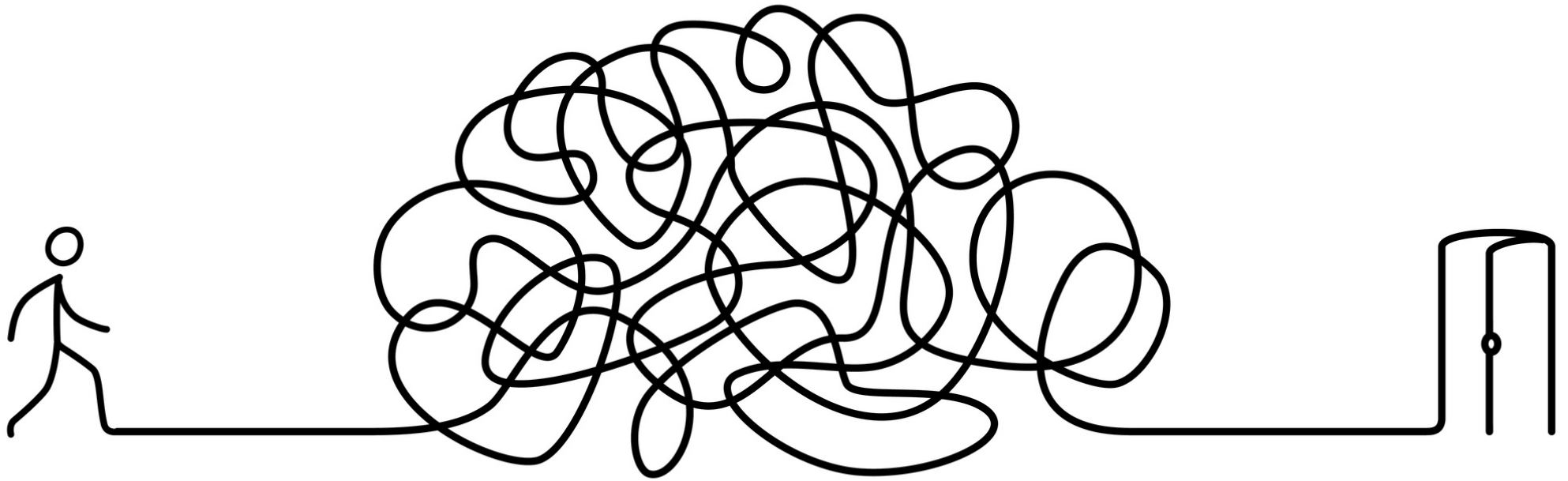
Category	ASHRAE Baseline	Upper Limit Target	Bid Stage Target	Test Period Actual	Post-M&V Actual
TOTAL	68	36	19	33	13
Carbon from Electricity	3	3	3	4	4
Carbon from fossil fuels	65	33	15	29	10

St. Paul's Hospital (SPH) Chiller 2 & Heat Recovery

- Context
 - Persistent cooling system issues
 - Failed chiller to be replaced triggered opportunity



St. Paul's Hospital Campus



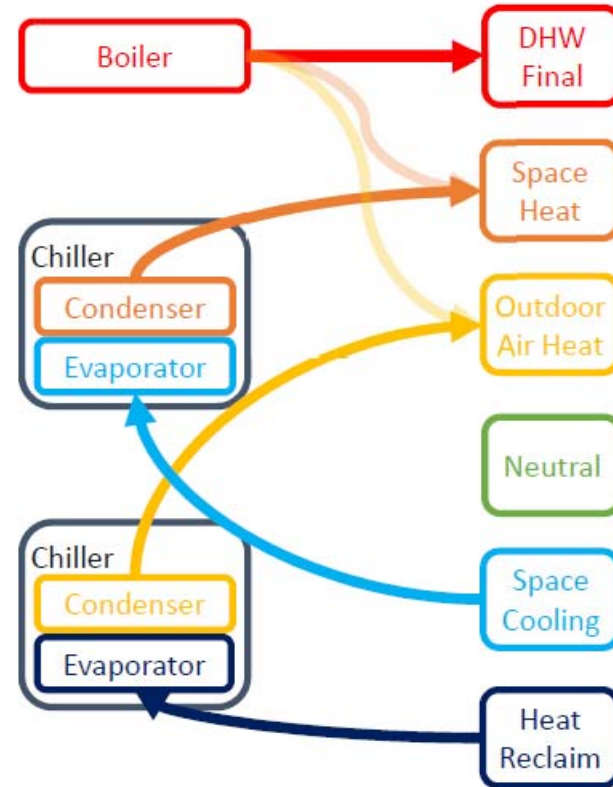


Heating

Cooling



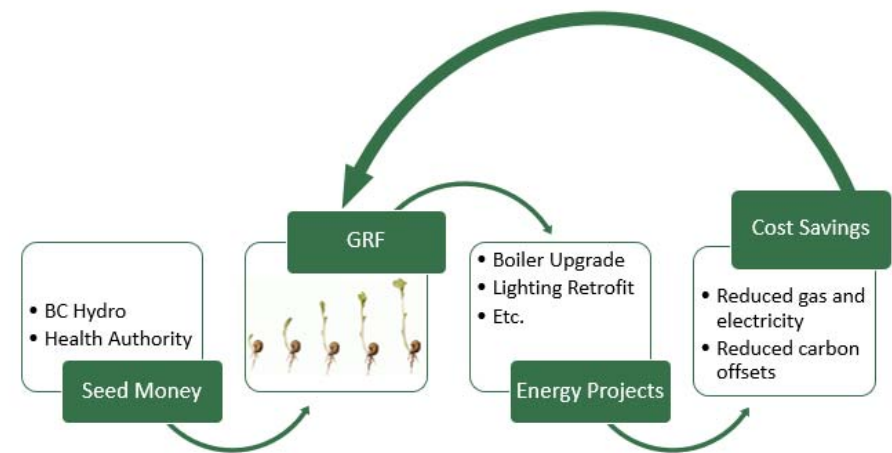
VS





SPH Chiller 2 & Heat Recovery Project Summary

- Approach
 - Collaborative
 - Integrated (Thermenex)
- Results
 - \$243,000 energy cost savings
 - 590 tCO₂e reduction
 - ~\$2,300/tCO₂e
 - \$565,000 Fortis incentive
- Co-Benefits
 - Catalyst for Green Revolving Fund



Take Away's Going Forward

- **Commit** to bold targets
 - Net zero carbon
 - Net carbon sequestration with “plant-based construction diet”
- **Courage** to seek potential
 - The intersection of healing, resilient & sustainable buildings
 - Passive House, etc.
- **Co-create** within constraints
 - Meet challenges together with creativity



If Collapse is inevitable?...Deep Adaptation

- Radical Hope
- Relinquishment
- Restoration
- Regeneration

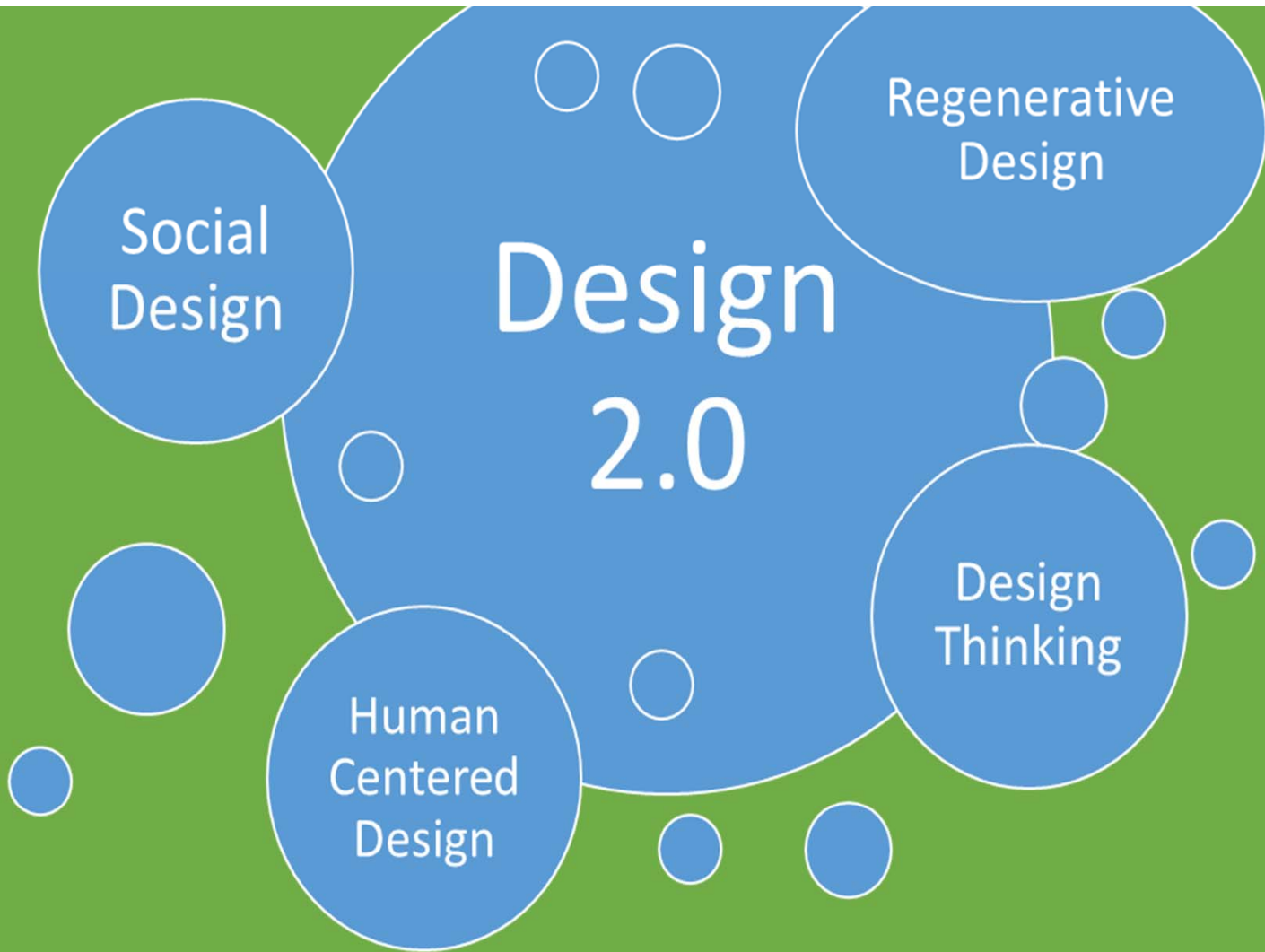
If Collapse is inevitable?...Deep Adaptation

- **Radical Hope**
 - Neither denial or blind optimism
 - “directed toward a future goodness that transcends the current ability to understand what it is” - Gosling
- **Relinquishment**
 - Letting go of certain assets, behaviours and beliefs (ie; giving up certain types of consumption)
- **Restoration**
 - Rediscovering attitudes and approaches to life (ie; re-wilding landscapes, etc.)
- **Regeneration**
 - Enhancing the ability of living beings to co-evolve

Types of Change

DEVELOPMENTAL	TRANSITIONAL	TRANSFORMATIONAL
Improvement	Replacement	Metamorphosis
Destination is known		Future state unknown
Pre-determined linear plans		Change process must “emerge” as you go
About taking the “right steps”		About cultivating the “right conditions”
Impacts people’s skills & actions		Must impacts people’s mindset & culture

Source: Adapted from “ What is Transformation, and Why Is It So Hard to Manage?”, Anderson, 2010



Credit: Slide informed by Cheryl Heller's webinar: [Applying Social Design to Sustainability](#)

What is Regenerative Development?

“The Regenesi Group first proposed the term regenerative development in 1995.

It describes an **approach** that is about **enhancing the ability of living beings to co-evolve**, so that our planet continues to express its potential for diversity, complexity, and creativity.”

Source: Regenerative Development and Design: A Framework for Evolving Sustainability by Regenesi Group

What is Regenerative Development?

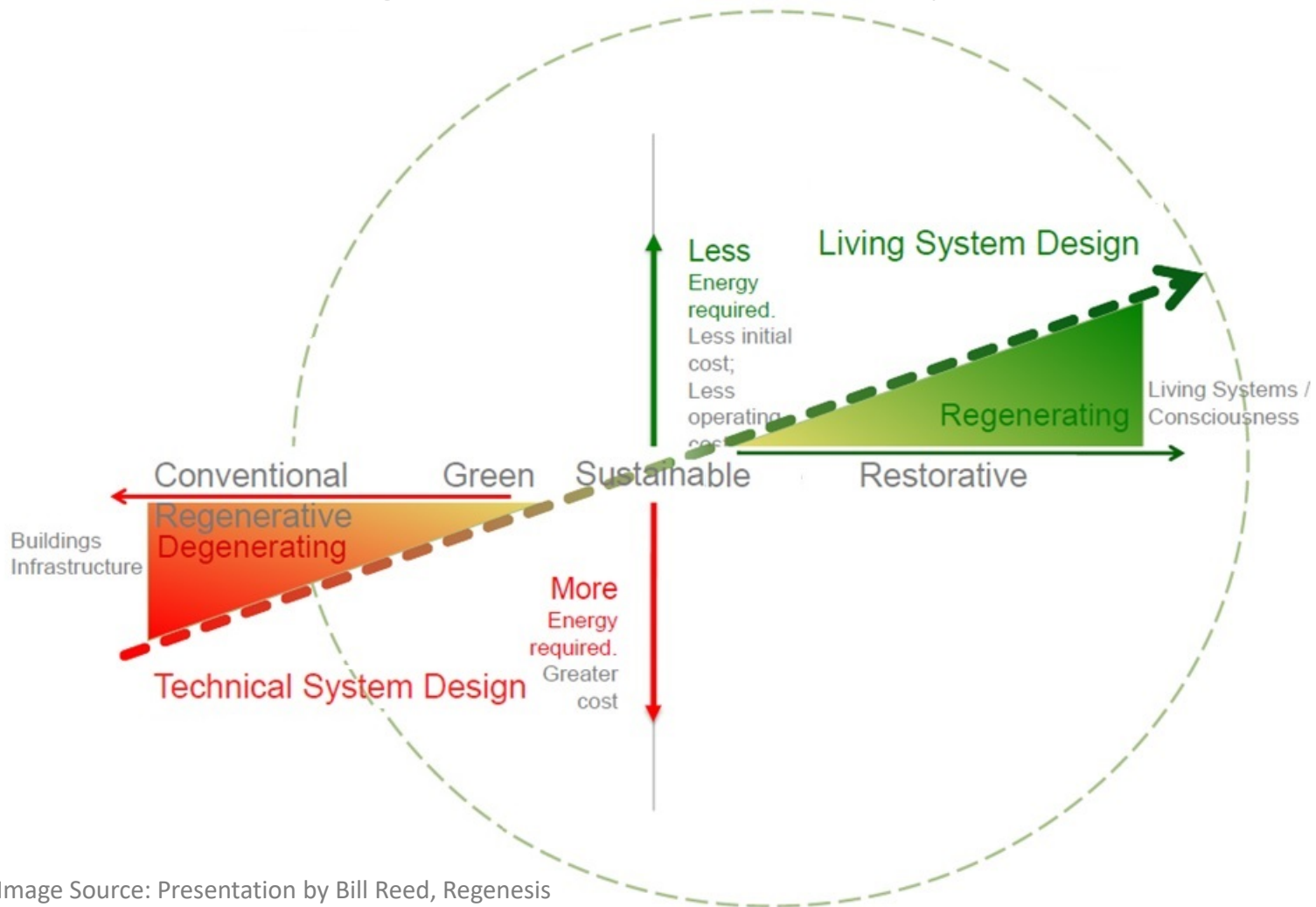
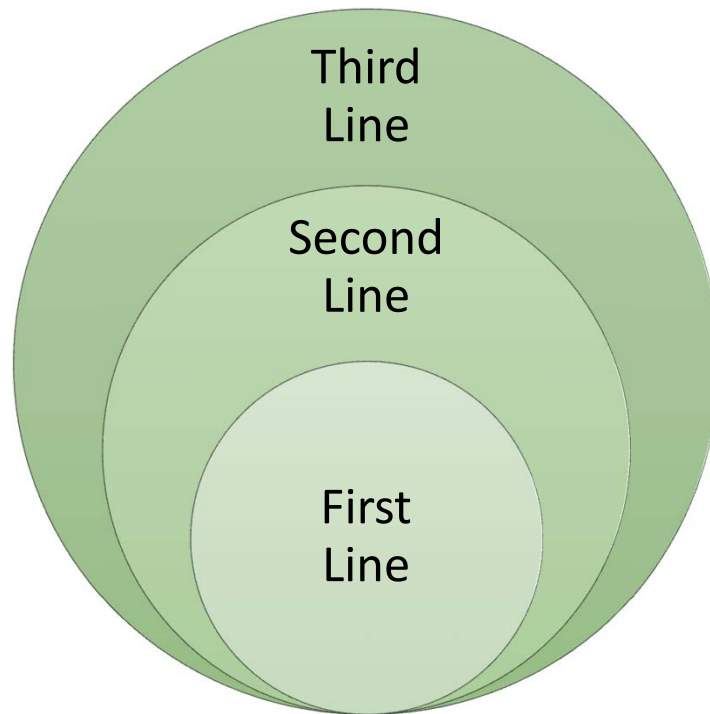


Image Source: Presentation by Bill Reed, Regensis

A different approach to design

	Conventional Approach to Design	The approach to design that's needed
Focus	Problem Solving	Realizing potential
Type of change	Incremental	Transformational
Physical scale	Often confined to the project boundary	Consider at least three nested wholes
Specificity	Solutions are often generic	Solutions born out of the uniqueness of the place
Time scale	Conceives of a static end state	Conceives of a dynamic evolution

The Three Lines of Work Framework



Third Line
Developing the **System**

Second Line
Developing the **Team / Group / Collaborators**

First Line
Developing the **Self**

Ongoing Learning

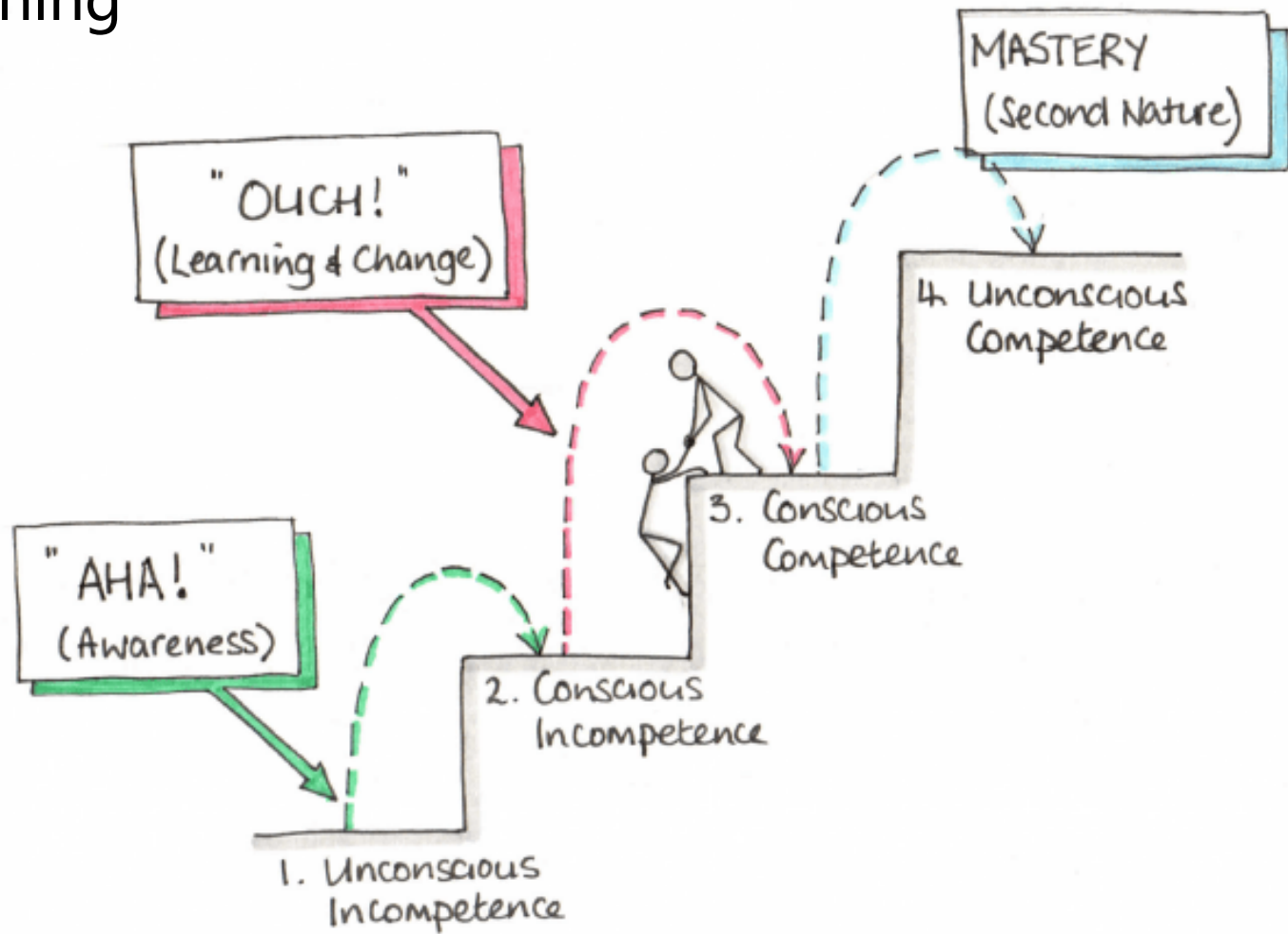
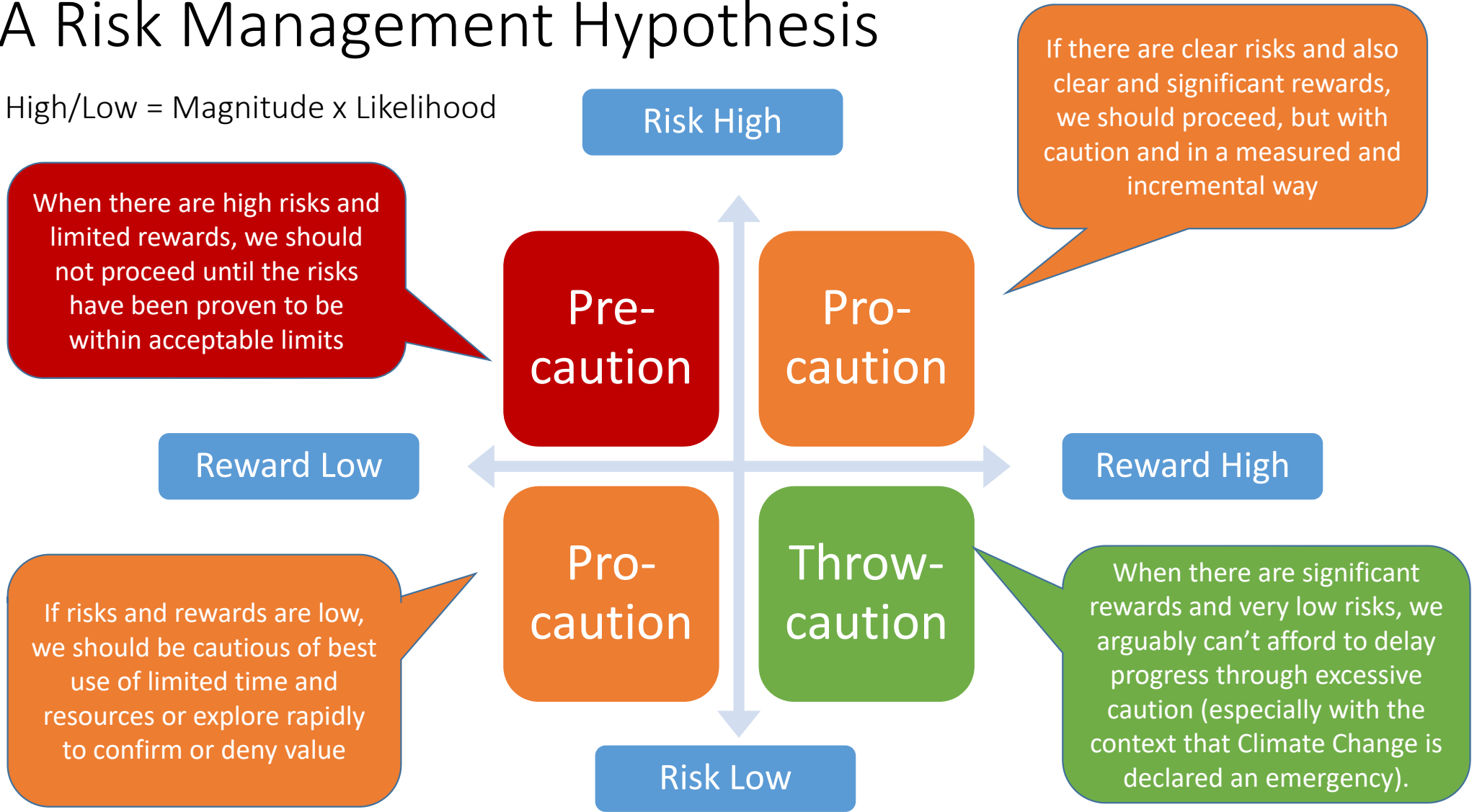


Image Source: <https://ukcpd.net/collegemembers/conscious-competence-ladder-developing-new-skills/>

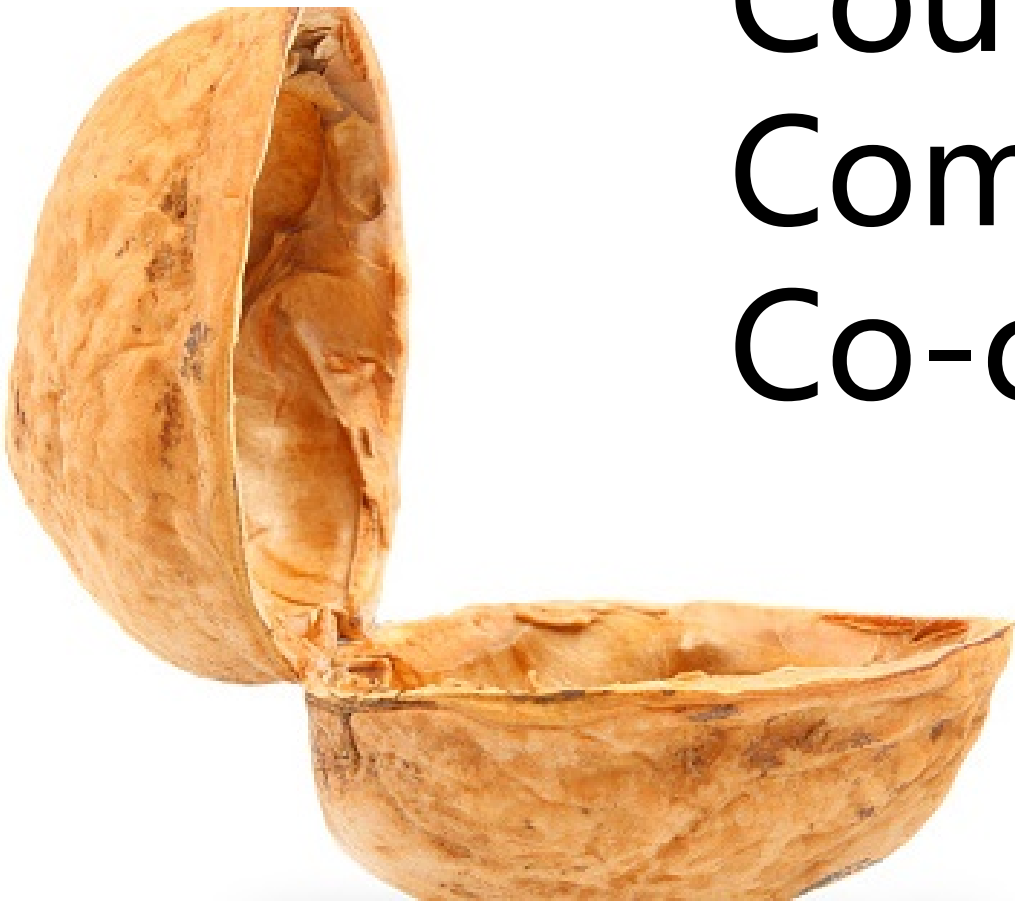
A Risk Management Hypothesis

High/Low = Magnitude x Likelihood



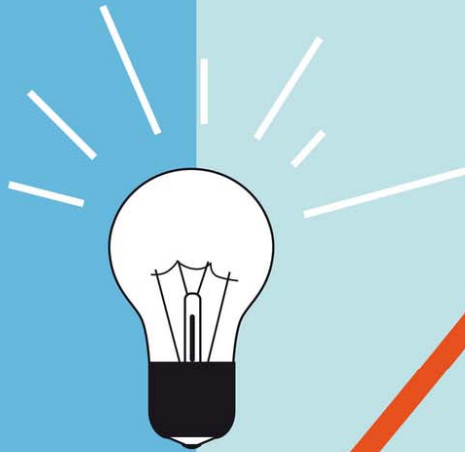
How can you **cultivate** these?

Courage
Commitment
Co-creativity

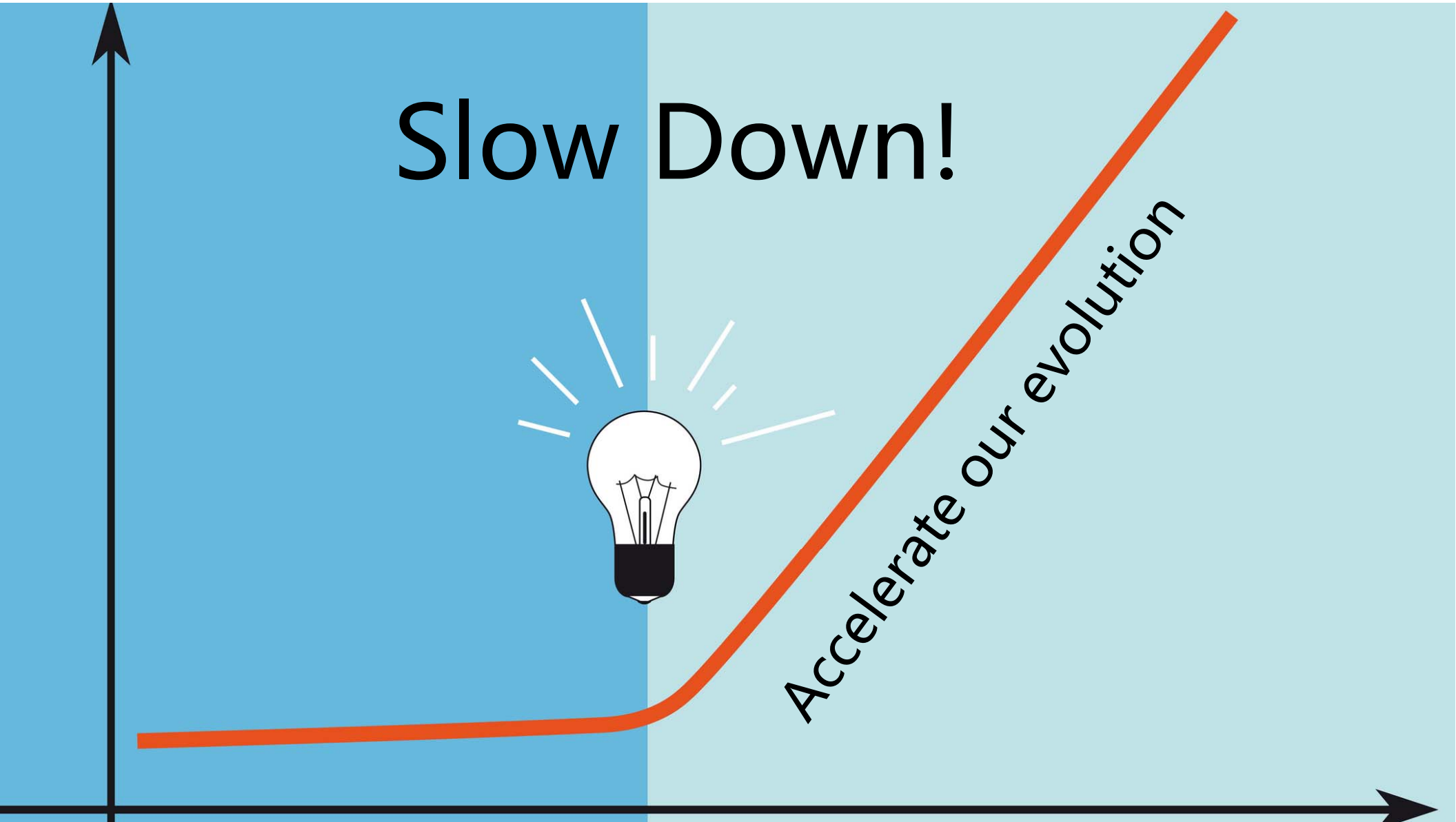


In yourself?
In your team?
In your projects?
In your organization?

Slow Down!



Accelerate our evolution



Discussion



Thank you!

Alex.Hutton@phsa.ca
Ryan.Galloway@interiorhealth.ca