Future proofing commercial buildings in Christchurch

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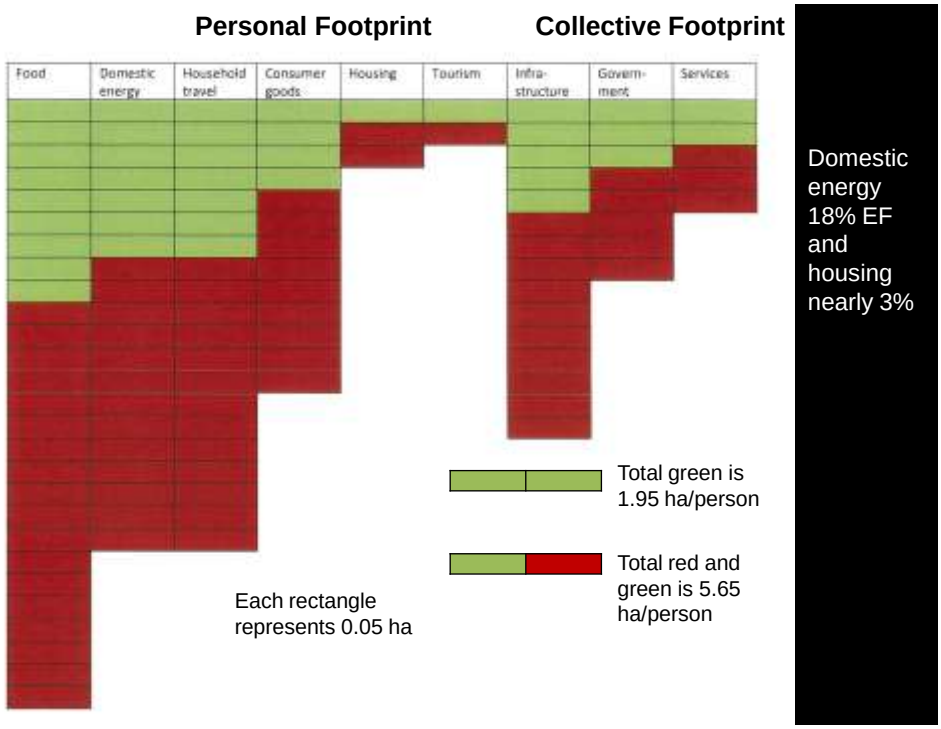
The buildings of today will be around after the end of cheap oil

What will the post-oil commercial building be like?





Land Type	Food	Transport	Consumer Goods	Holidays	Home energy	Housing	Infrastructure	Government	Services	Total NZ EF	EF per person
	gha	gha	gha	gha	gha	gha	gha	gha	gha	gha	gha
Consumed	53,202	219	38,736		27696.18186	84,807	229,081	8,693	44,055	483,958	0.1097
Garden						151,656	91,137			242,795	0.0550
Crop	917,479		33,701							951,179	0.2155
Grazing	1,488,285		869,169							2,357,454	0.5575
Forest	218,002		1,040,024		256,546	39,800		2,918	175,456	1,732,743	0.4096
Energy	1,277,239	1,499,707	2,545,904	837,228	220,471	296,824	181,228	52,877	378,496	7,179,814	1.6980
Fishing	1,314,299									1,314,299	0.3108
Total Land	5,269,507	1,700,026	4,487,534	837,228	504,113	483,085	501,446	84,454	597,946	14,124,243	3.3408
Proportion	36.59%	17.84%	31.77%	4.51%	3.57%	3.42%	3.42%	0.60%	4.23%		

Data from Ella Lawson

	Food	Transport	Goods	Holidays	Home energy	Housing	Infra-structure	Govern-ment	Services
NZ EF 3.3gha/ person	36.6%	12.0%	31.8%	4.5%	3.6%	3.4%	3.4%	0.5%	4.2%
Cardiff EF 5.6gha/ person	24.0%	18.0%	11.0%	2.0%	18.0%	3.0%	13.0%	7.0%	5.5%

The energy used by people driving to work is at least as great as the energy used by the building in which they work.

Diesel car 10,000m^2

Ethanol car 5,000m^2

Ethanol motorcycle 1,000m^2

Area of land to travel 10,000km using fuels based on plants

Fuel	Land ha
Vegetable oil (for diesel)	300,000
Ethanol (for petrol)	750,000
Total	1,050,000

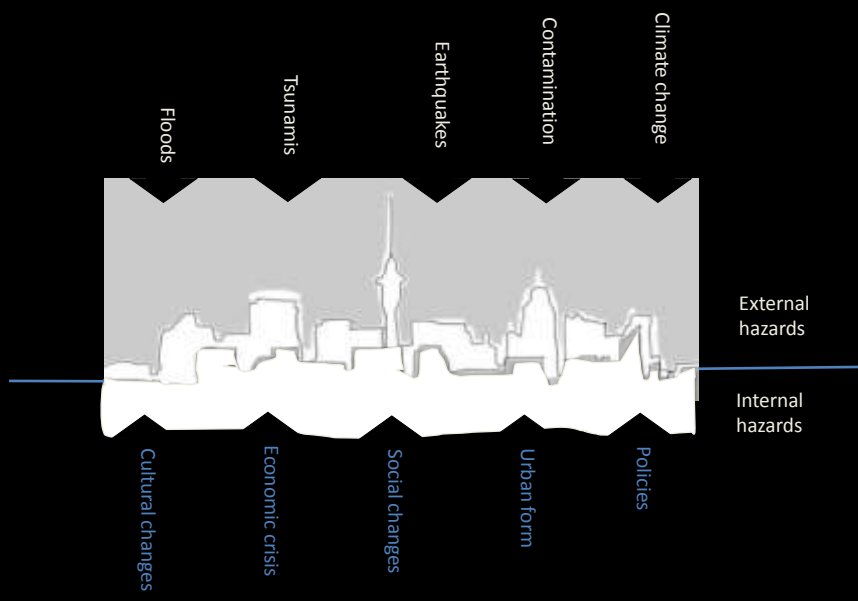
NZ has 2,400,000 Ha of farmland.

Land area in hectares to grow vehicle fuels to replace current NZ consumption.

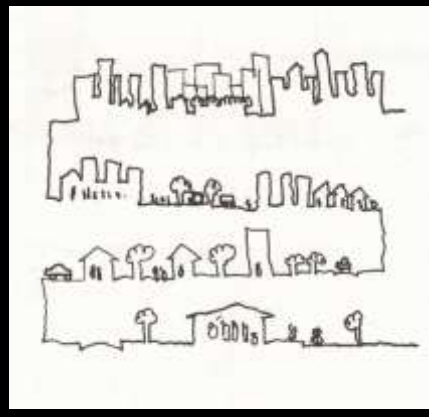
The Shard, London with 53,585m^2 office space over 27 floors and only 47 carparks for whole building (43 lifts).

Shell Centre, 1961

Which hazards?



Ecological resilience



"The capacity of a system to absorb disturbance and reorganize while undergoing change so as to retain essentially the same function, structure, identity, and feedbacks (Walker et al. 2004). This ability depends on the influences from states and dynamics at scales above and below (Peterson et al. 1998)"

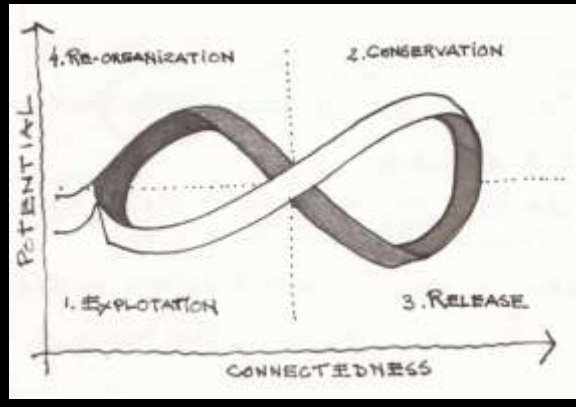
A system evolving:
resilience is not a goal but rather an attribute of a system (in this case the system of commerce in Christchurch)

http://www.ipsnews.net/2012/06/sudanese-refugees-dying-of-thirst/

http://www.jetsetzero.tv/tag/making-local-friends/

The resilience capacity is what keeps a system within the point of equilibrium when disturbances try to make it shift to a different regime. A shift to a new regime can be something desirable or not.

Adaptive cycle



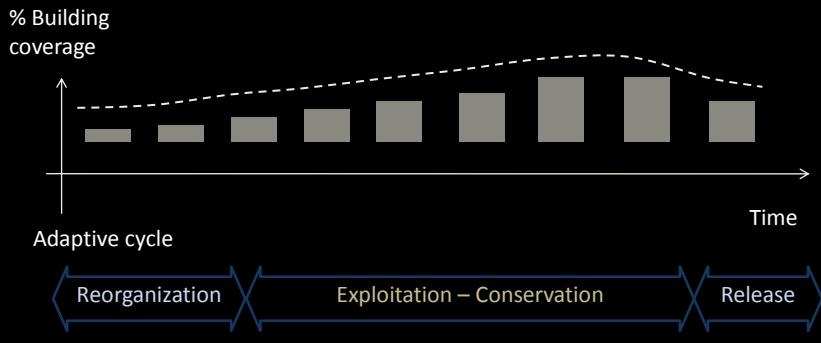
The adaptive cycle can be synthesized into two trends: the “front loop and back loop”. The front loop, the phases from “exploitation” to “conservation”, could be exemplified by the accumulation of capital, slow incremental growth, predictability and stability needed for urban systems to work. The back loop, the phases from “release” to “reorganization”, is the dynamic, which makes urban systems evolve.

1968 - THE ATRIUM of Berkeley's Mathematical Sciences Research Institute (1962) makes the building one connected whole. Every one of the 56 offices opens directly into the common area, and corridors and stairs link them conveniently. The clink and clutter of daily afternoon tea drifts enticingly up from the floor of the atrium. But the building has become burdened by success. The programs have grown so much that all the offices designed for occupation by individual visiting mathematicians have been forced to double up, and the roommates disturb each other's concentration with phone calls, visitors, and chat—to the point that many now work at home, destroying the whole interactive purpose and glory of the building. A new wing is planned to add 30 new offices, a large common room, a larger library, a cafeteria, an auditorium, and half a dozen small seminar rooms sorely needed.

Success leading to too much rigidity and a reorganisation

Adaptive cycles in urban landscapes

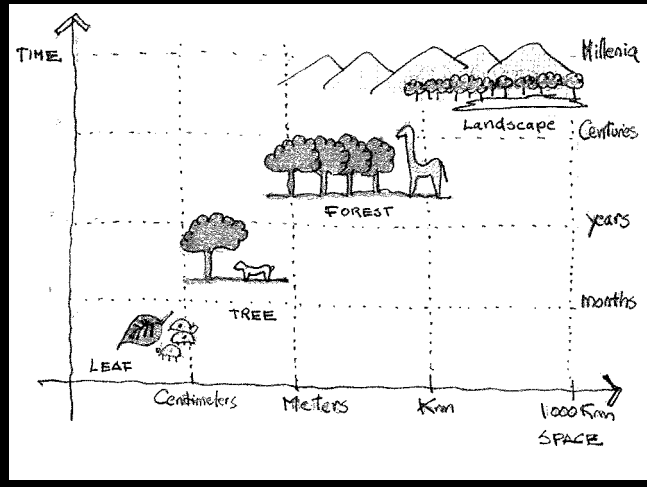
Burgage cycle



Urban Panarchy: nested set of adaptive urban cycles

Change happens at different scales at different rates

Textural discontinuities hypothesis

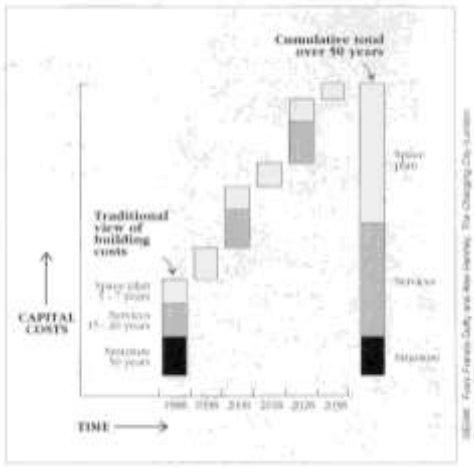


According to the *Textural Discontinuities Hypothesis* (TDH), the distribution of resources in ecosystems should exhibit the same discontinuities that are found in the structuring processes that have generated the landscape (Holling, 1992).

If we think of buildings as species, we can use this idea, at least in a metaphorical way (one dominant species)

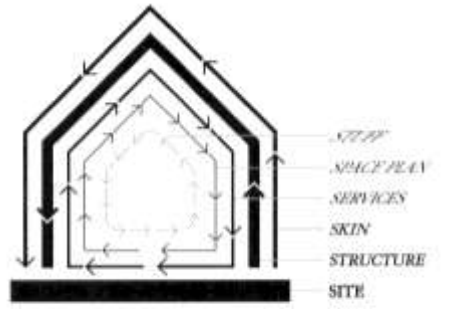
Linh Dam is a new urban development 10 km from the centre of Hanoi, Vietnam that incorporates indigenous values and practices: medium rise, low rise, urban food growing, commercial and residential (different species in same location)

Images from Thuc Tran Han



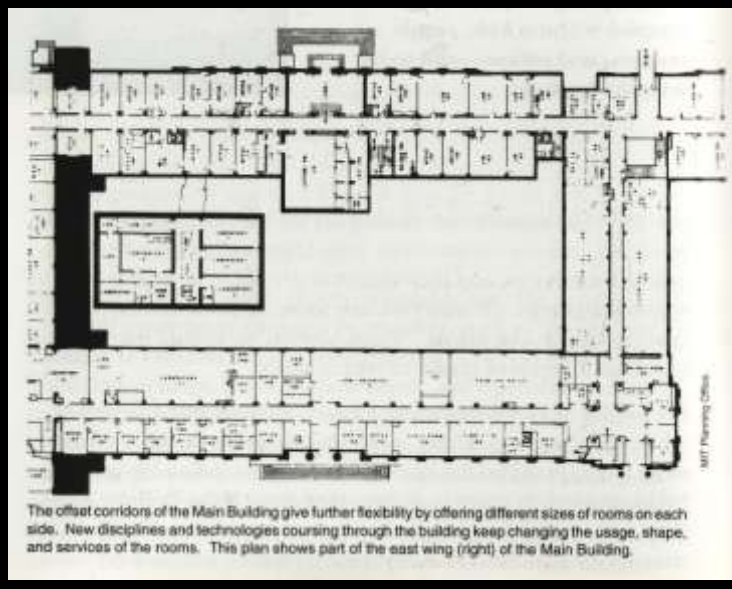
Duffy indicated the need to think about life-cycle costs: buildings always change

Brand observed different rates of change for different components in the building

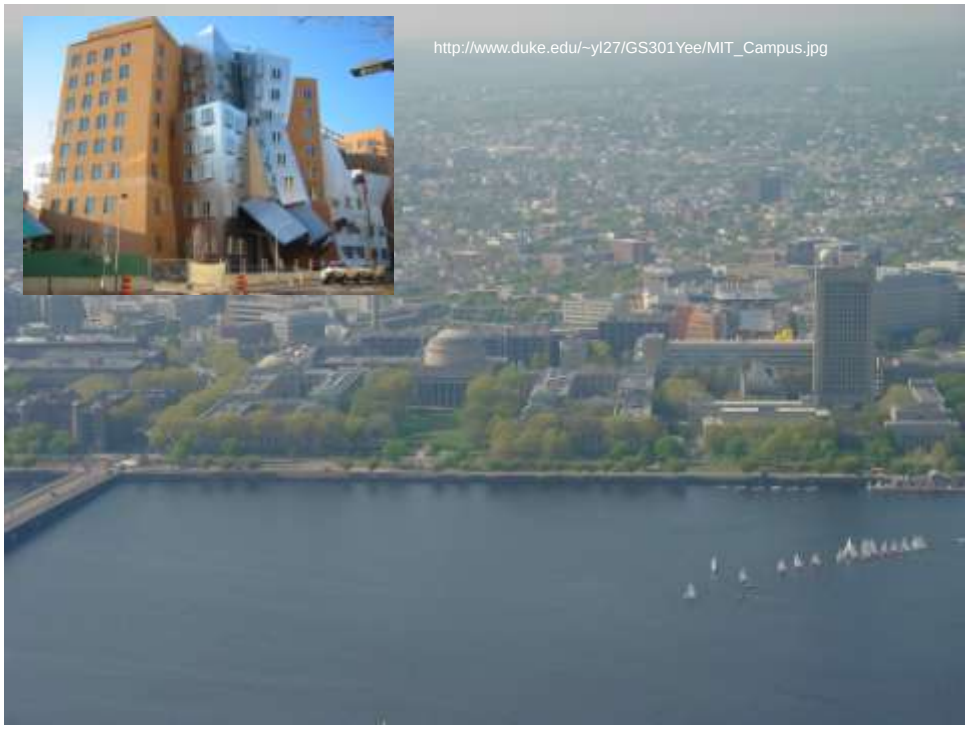


SHEARING LAYERS OF CHANGE. Because of the different rates of change of its components, a building is always tearing itself apart.

How do you design for change?



The offset corridors of the Main Building give further flexibility by offering different sizes of rooms on each side. New disciplines and technologies coursing through the building keep changing the usage, shape, and services of the rooms. This plan shows part of the east wing (right) of the Main Building.



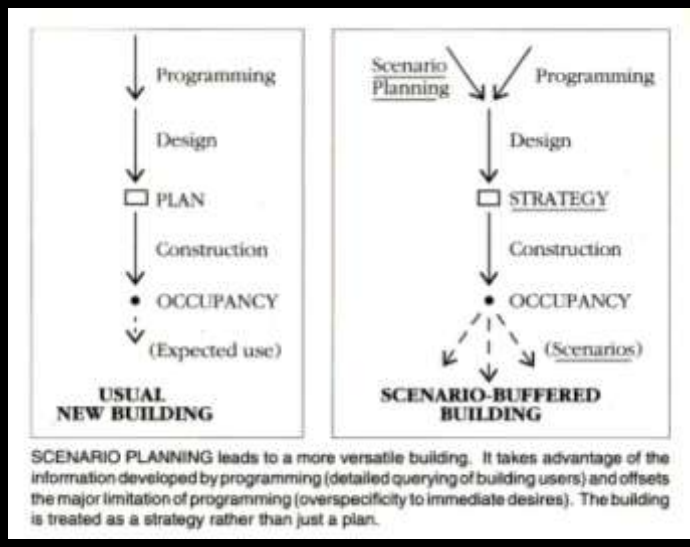
Edges form opportunities

http://emichai.blogspot.co.nz/2010/04/mapletree-anson.html

Column free space Singapore Office

Columns in refurbished office, Tokyo, defining temporary meeting space

http://coolboom.net/interior-design/ficc-inc-office/

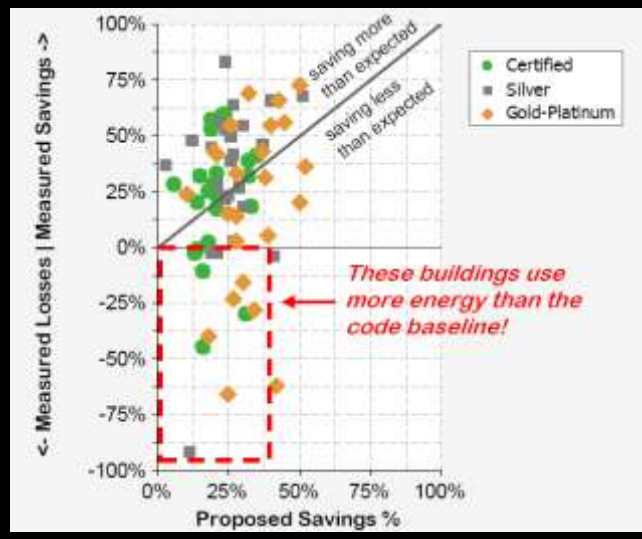


Brand, *How Buildings Learn*, p.182

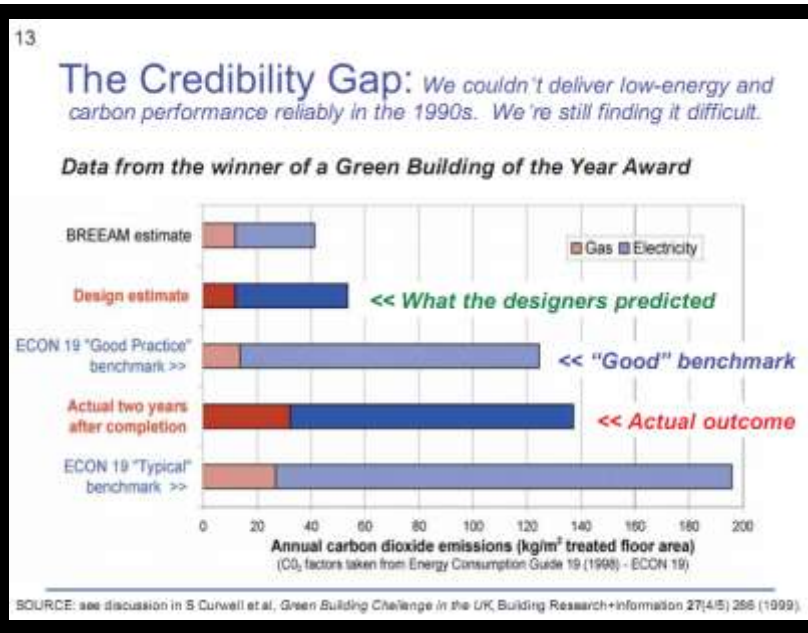
When (not if) the expected use changes and a different scenario happens the building has been planned for this

A characteristic of resilient systems is feedback loops. The original intention of NABERS was to provide such a loop for aspects of building performance

The chart shows measured energy consumption in LEED rated buildings: it is clear that a LEED rating does not necessarily mean low-carbon.



Source: Turner and Frankel (2008)



The same applies for BREEAM ratings in the UK.

Slide from Adrian Leaman of Usable Buildings Trust

Designers often get it wrong. Portcullis House in London uses four times as much energy as the designers intended

http://www.myk.mcmail.com/london/south_bank/london_eye/

- Where you put the building is vital for its overall environmental impact
- Buildings are systems not objects
- “Long life, loose fit, low energy” is the path to resilience
- Put the money in the part that changes least (the site/ the structure)
- Be part of the feedback loop (NABERS?)