

Interlinked thinking as a tool to tackle complexity

Vicky Forgie

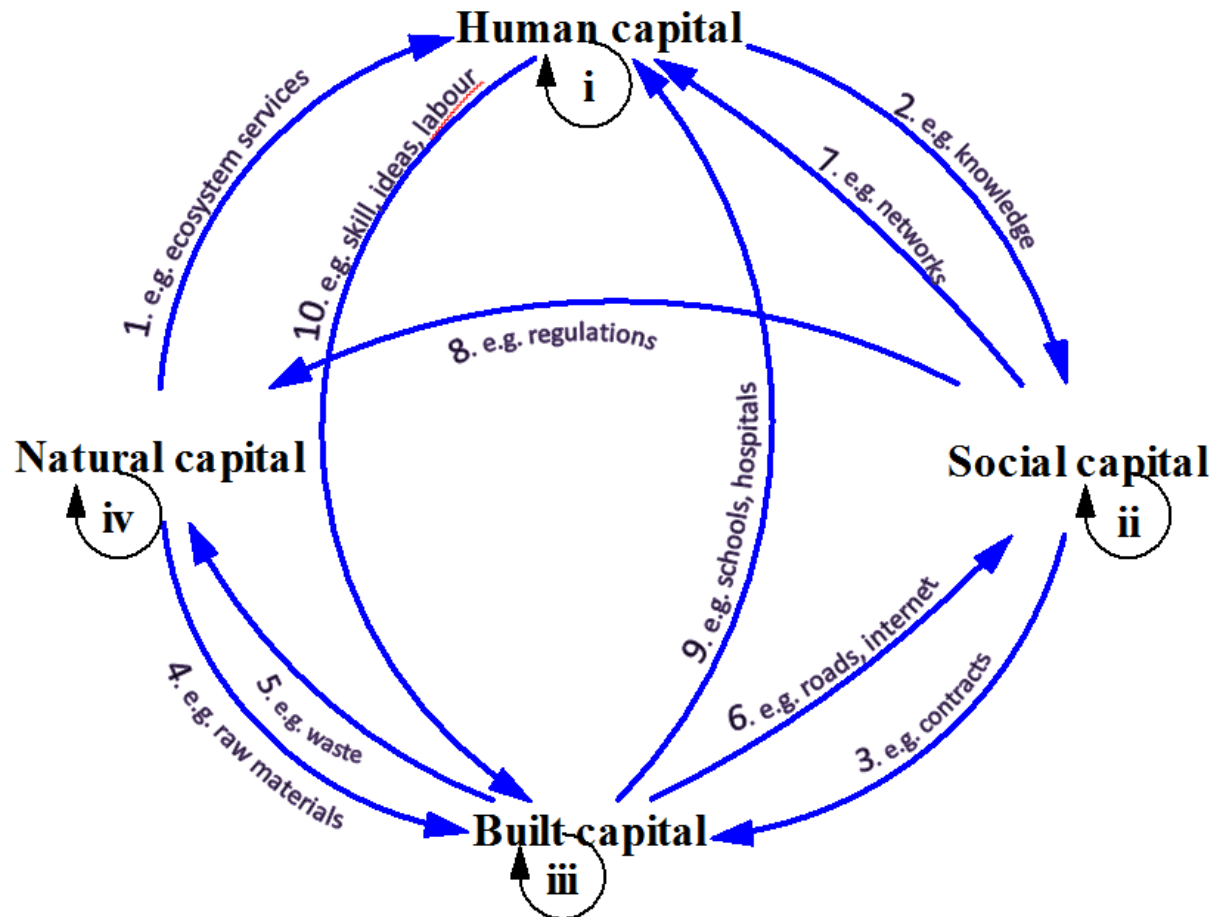
Marjan van den Belt

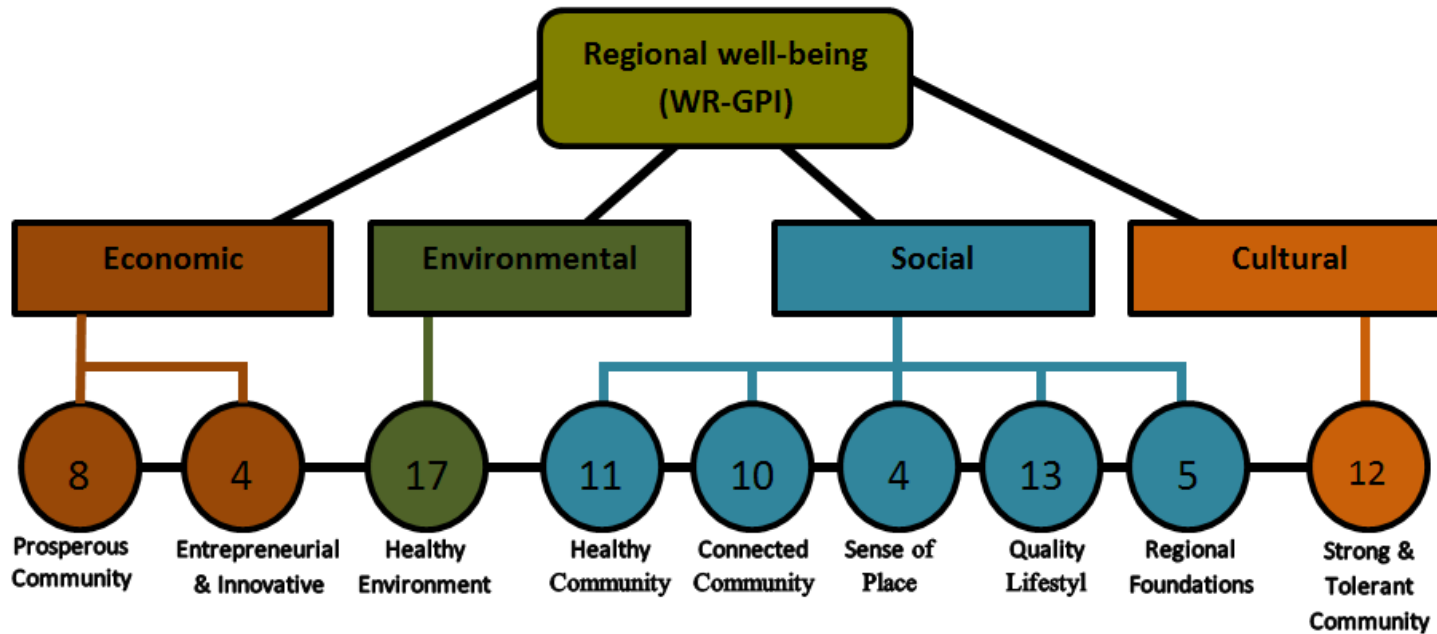
Garry McDonald

International Society for Ecological Economic
Conference, Washington, DC

June 27, 2016

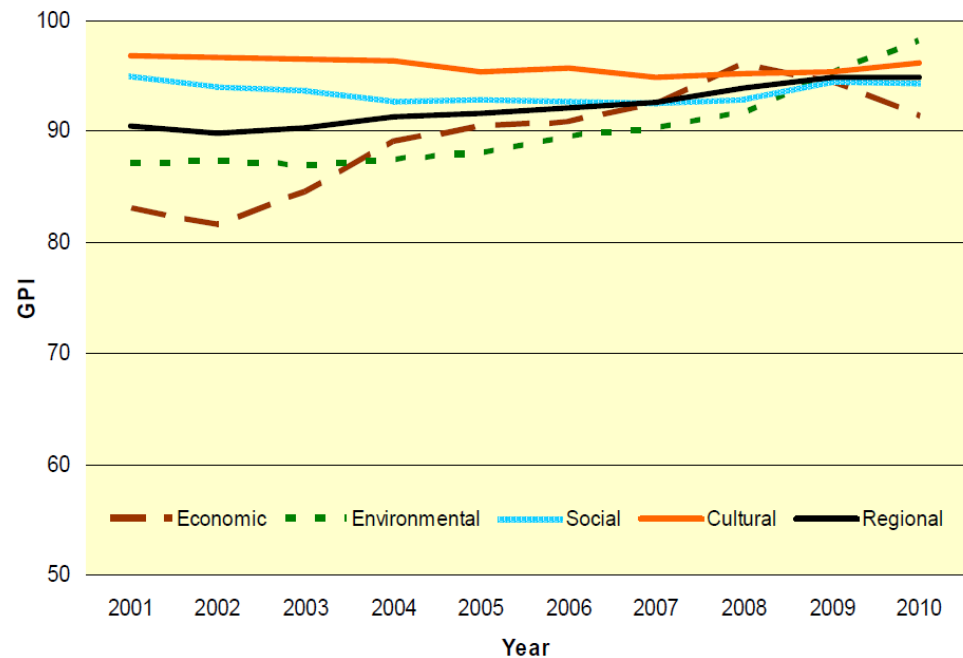
Well-being is a complex system





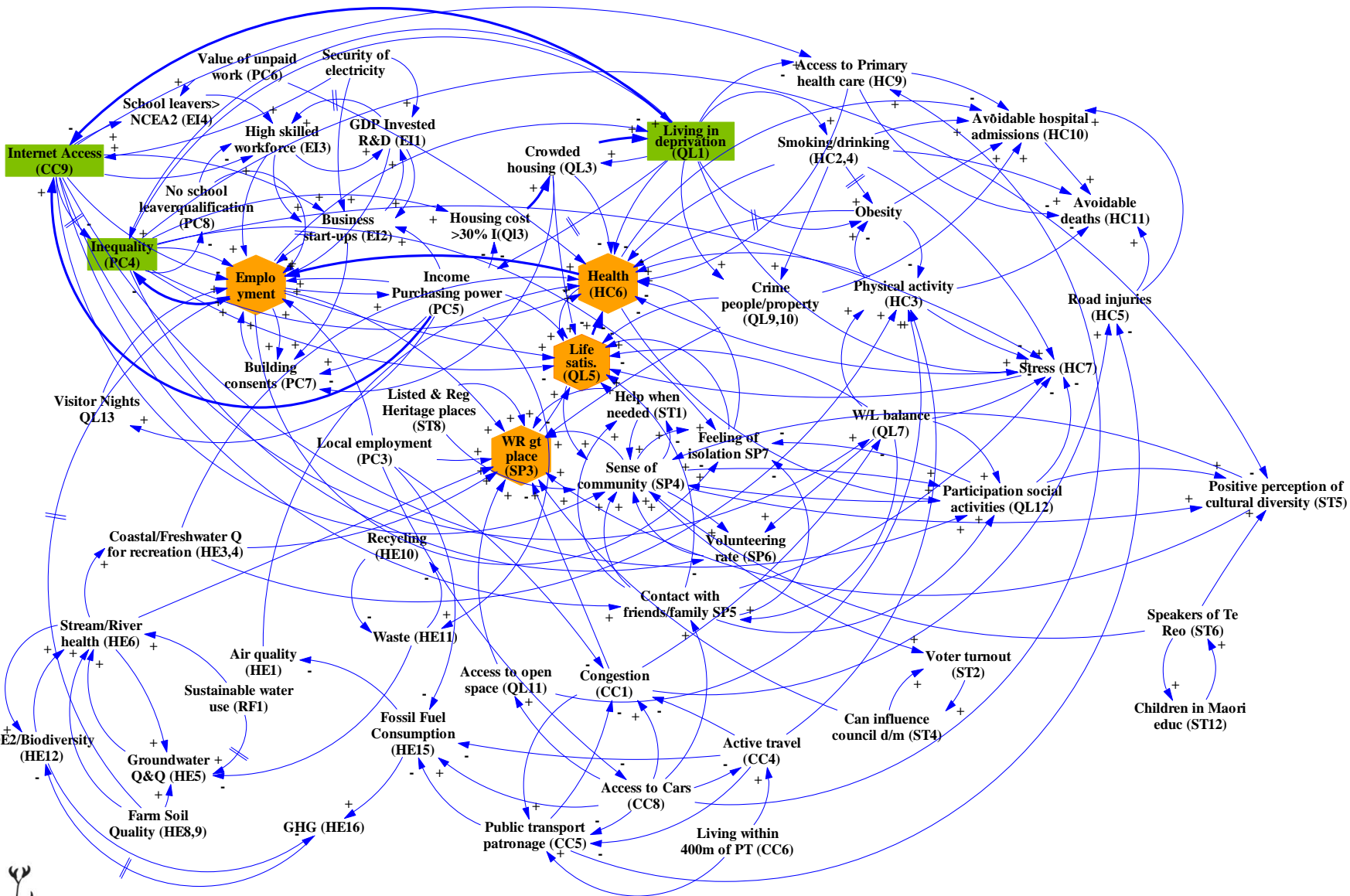
Wellington Region Genuine Progress Index Structure

Source: Wellington Regional Strategy Office, 2011

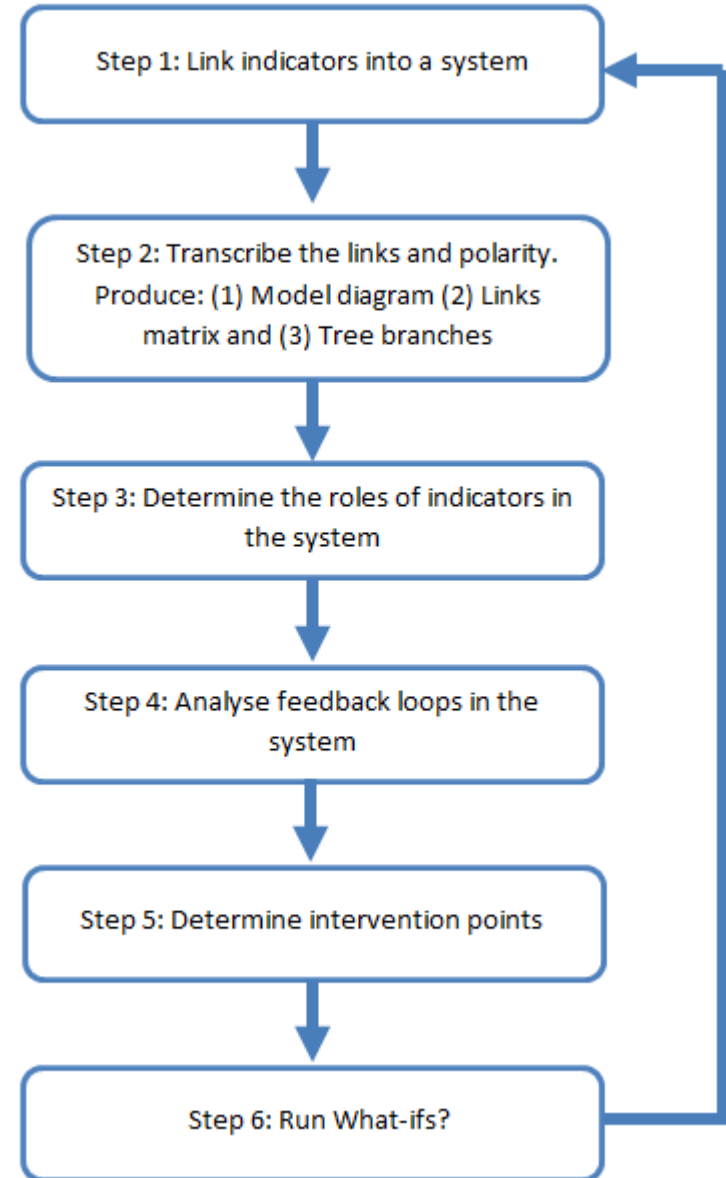


Dilemma:

- Working with individual components ignores the dynamics from the interactions that determine behaviour in the real world
- How to help people to think across boundaries?

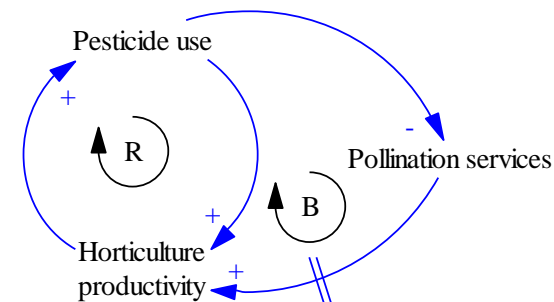


Steps in interlinked thinking

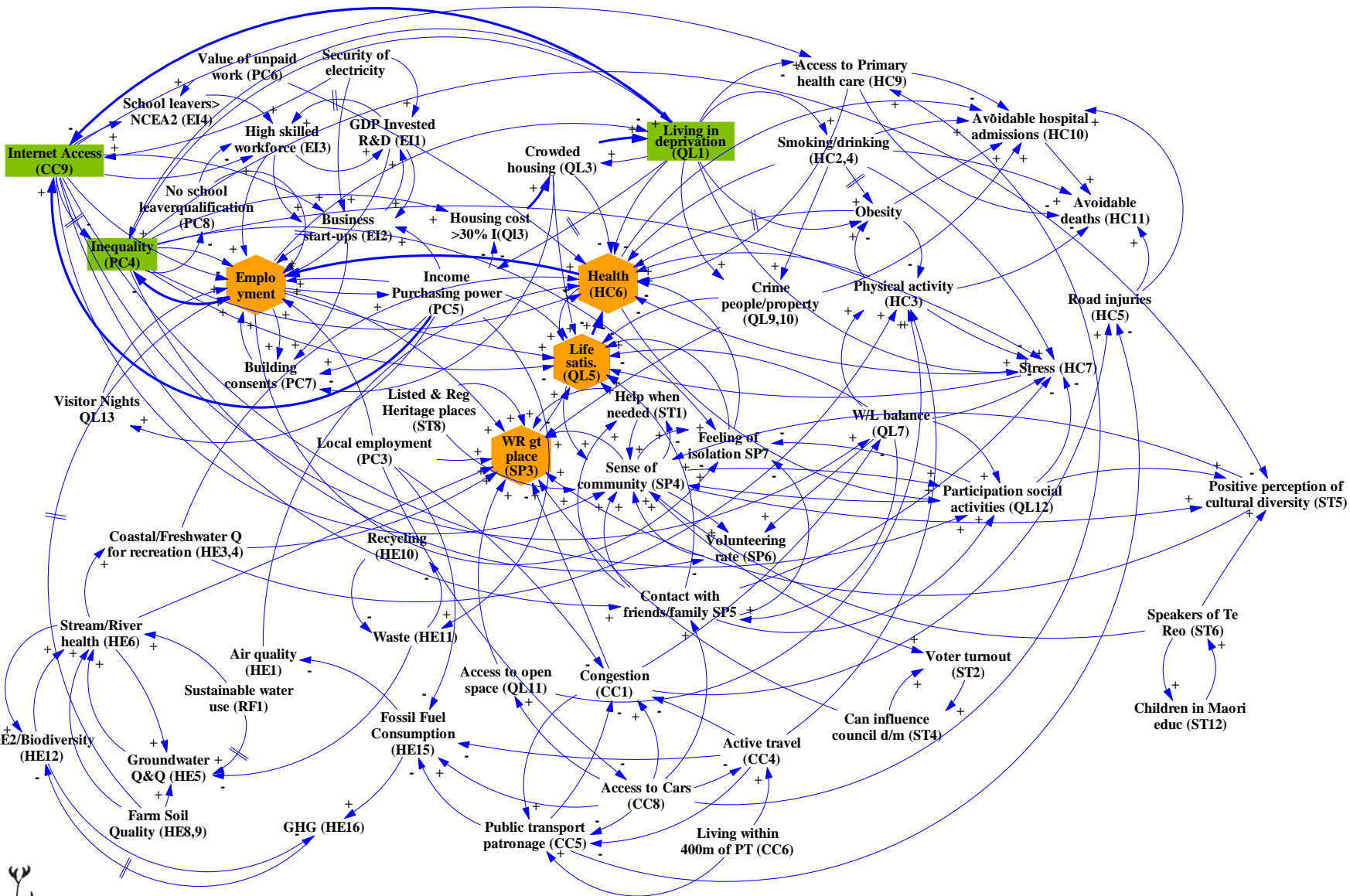


Link indicators

- Ideally a participatory workshop process.
- Large sheets of paper with indicators printed on are provided to each group.
- Participants link indicators following the rules for causal loop diagrams (direction, polarity and delays)
- Information on causal loop models is transcribed to a matrix and an algorithm run to analyse the links in the system



	Pesticide use	Pollination services	Horticultural productivity
Pesticide use		-1	1
Pollination services			1
Horticultural productivity	1		



Indicator	Loops	Passive	Active	Active/ Passive	Critical & <i>Buffer</i>
Employment rate	2505	12	7	0.58	84
Perception of health as good (HC6)	2274	13	4	0.31	52
Population living in deprivation (QL1)	2143	3	10	3.33	30
Access to internet (CC9)	2054	3	10	3.33	30
Life sat (QL5)	1778	12	2	0.17	24
Sense of local community (SP4)	1725	9	7	0.78	63
Purchasing power Hshld median weekly income (PC5)	1548	2	8	4.00	16
P80/P20 ratio gross weekly Hshld income (Inequality PC4)	1471	3	10	3.33	30
Participation in social activities (QL12)	1299	5	4	0.80	20
Contact with friends/family (SP5)	976	3	6	2.00	18
Population living in crowded housing (QL3)	968	2	4	2.00	8
Feeling of isolation (SP7)	960	5	2	0.40	10
Spend >30% disposable income on housing (QL2)	949	2	1	0.50	2
Satisfied work/life balance (QL7)	856	2	6	3.00	12
WR great place to live (SP3)	758	12	1	0.08	12
Residents experiencing regular stress (HC7)	636	7	2	0.29	14
Perception of availability support (ST1)	515	2	3	1.50	6
Positive perception of cultural diversity (ST5)	509	4	2	0.50	8
Volunteerism rate (SP6)	181	3	1	0.33	3
Workforce employed in high skill occupations (EI3)	175	4	3	0.75	12
Business start-ups and closures (EI2)	165	5	3	0.60	15
Participation in regular physical activity (HC3)	133	5	4	0.80	20
Average voter turnout local elections (ST2)	130	2	1	0.50	2
Perception can influence council d/m (ST4)	130	1	2	2.00	2

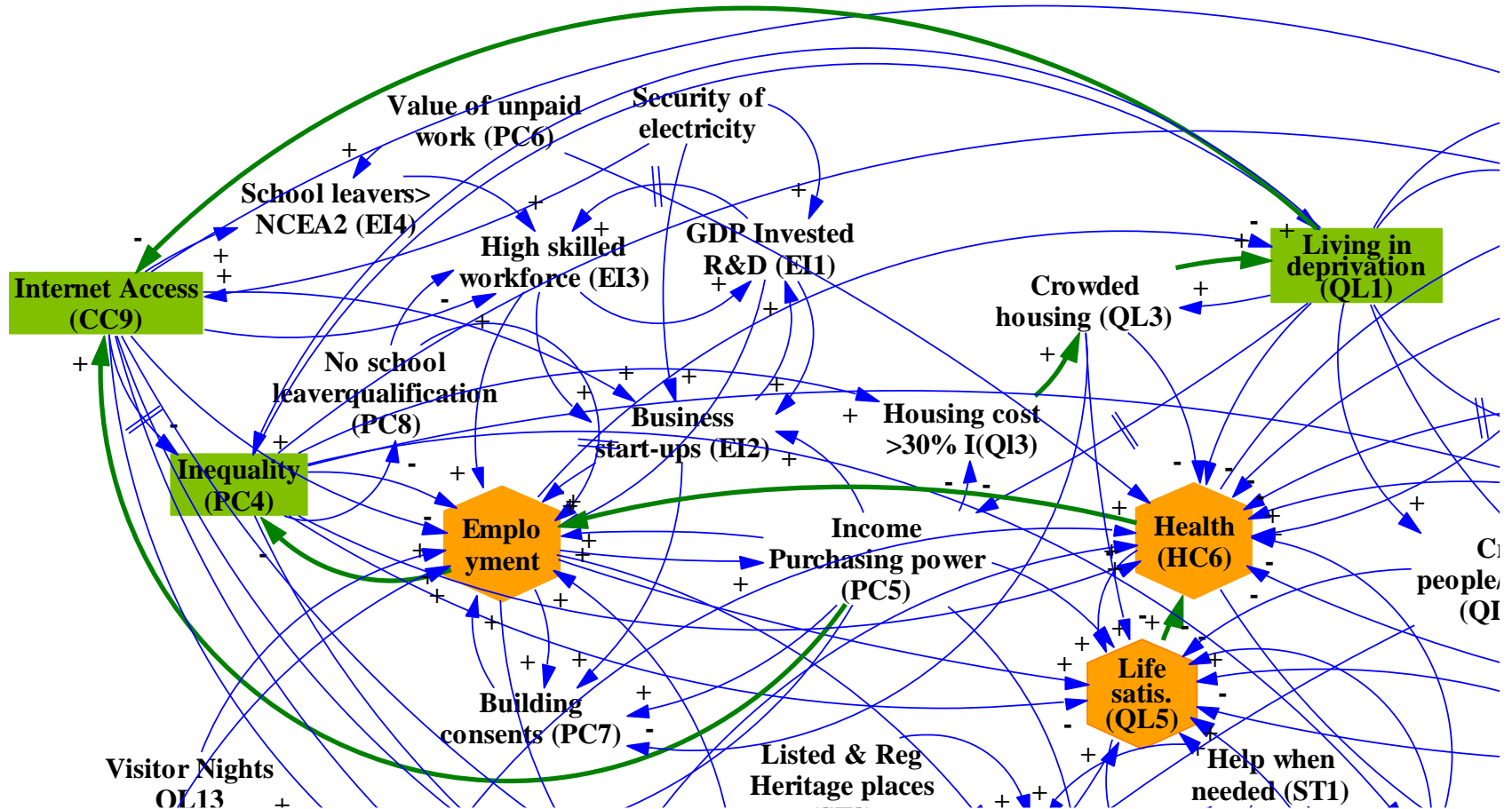
Indicator role

- **Active** indicators capable of triggering change with little change in themselves: (i) Inequality (ii) Access to internet; and (iii) Population living in deprivation
- **Passive** indicators have a large number of links to them are responsive to small changes. (i) Perception of health as good; (ii) Employment rate; (iii) WR great place to live; and (iv) Life satisfaction.
- **Critical** indicators have a strong influence on other indicators and highly influenced by other system factors: (i) Employment rate; (ii) Sense of local community; and (iii) Perception of health as good.

Analysis of feedbacks

- Employment rate is most highly connected. When this indicator is removed only 2.2% of loops remain.
- System is orientated towards **reinforcing** loops, with 2,445 of the total 2,562 reinforcing and only 60 **balancing** loops. This indicates the system is not stable in the long term and is oriented towards growth or decline which brings the risk of overshoot and collapse.

Strong links



→ strong links in system

Strong links

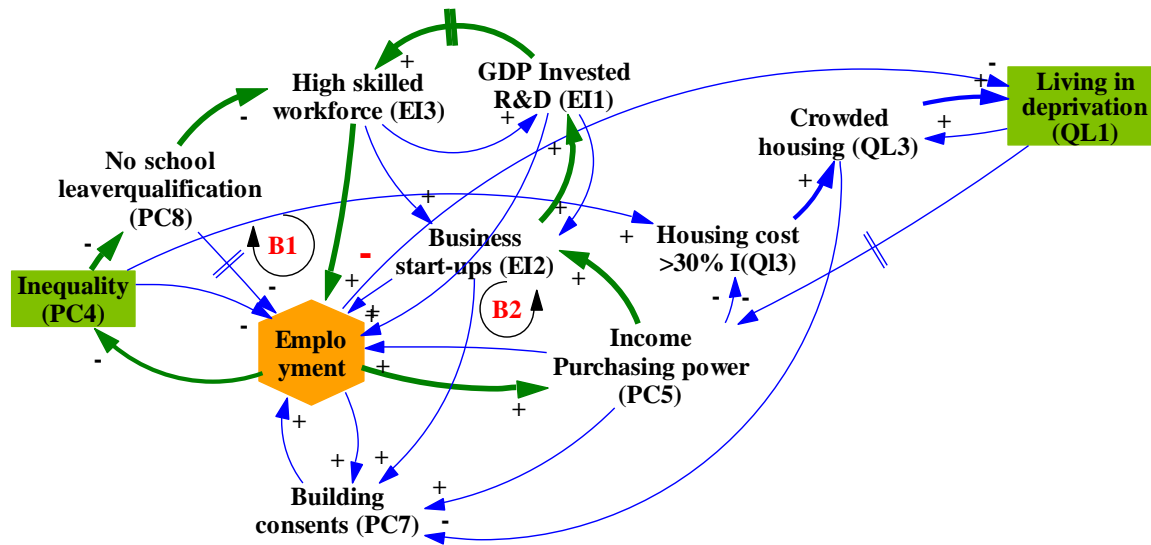
From indicator	To indicator	Total
Perception of health as good (HC6)	Employment rate	2248
Life satisfaction (QL5)	Perception of health as good (HC6)	1185
Employment rate	P80/P20 ratio gross weekly household income (PC4)	1075
Purchasing power household median weekly income (PC5)	Access to internet (CC9)	1072
Population living in deprivation (QL1)	Access to internet (CC9)	982
Spend >30% disposable income on housing (QL2)	Population living in crowded housing (QL3)	949
Population living in crowded housing (QL3)	Population living in deprivation (QL1)	902

Potential intervention points

A good **intervention** indicator has a high active value and low passive value.

(i) Inequality; (ii) Access to internet; (iii) Population living in deprivation; (iv) Purchasing power household median weekly income; (v) Hazardous smoking/drinking; (vi) Satisfied work/life balance.

What-if scenario



Strengths of interlinked thinking

- Increased understanding of the indicators used to assess well-being and encouraged integrated thinking
- Made the relationships between indicators visible
- Conceptualised well-being as a system
- Communicated the challenges and complexity that exists with well-being
- Provided insight into well-being drivers, how change occurs, and possible consequences
- Can be carried out within time and budget constraints
- Can be done by people without systems modelling expertise

Reservations

- System model and analysis is a function of the links made
- Doesn't give a definitive "answer"
- Not a fully quantitative system dynamic model that shows stock changes over time
- There is a limit to the number of links that can be handled

Thank you



Dilemma:

- Working with individual components ignores the dynamics from the interactions that determine behaviour in the real world
- How to help people to think across boundaries?

Qualitative

Quantitative



Systems thinking *Interlinked thinking*

Mediated modelling

System dynamics models

Integrated scenario explorers