Vision and Transition

Project of Transition to Sustainable Energy and Material Systems

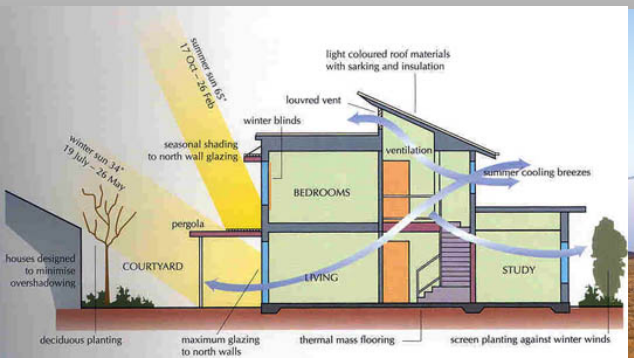
Associate Professor Susan Krumdieck
Department of Mechanical Engineering
University of Canterbury

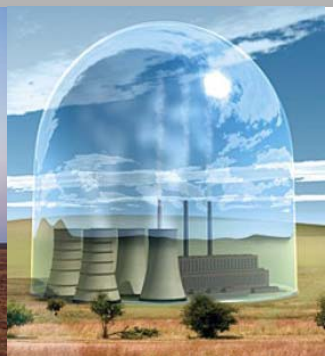
AEMS Lab
Advanced Energy and Material Systems

Planning for Change, Changing the Plan

Current Approach to "Sustainability Engineering"

- Electric Cars, Hydrogen Fuel Cells
- Carbon Footprint and Off-setting
- Smart Meters, Distributed Generation
- Wind Energy, Marine Energy, Solar Energy
- Carbon Capture and Sequestration
- Reducing Pollution, Increasing Efficiency



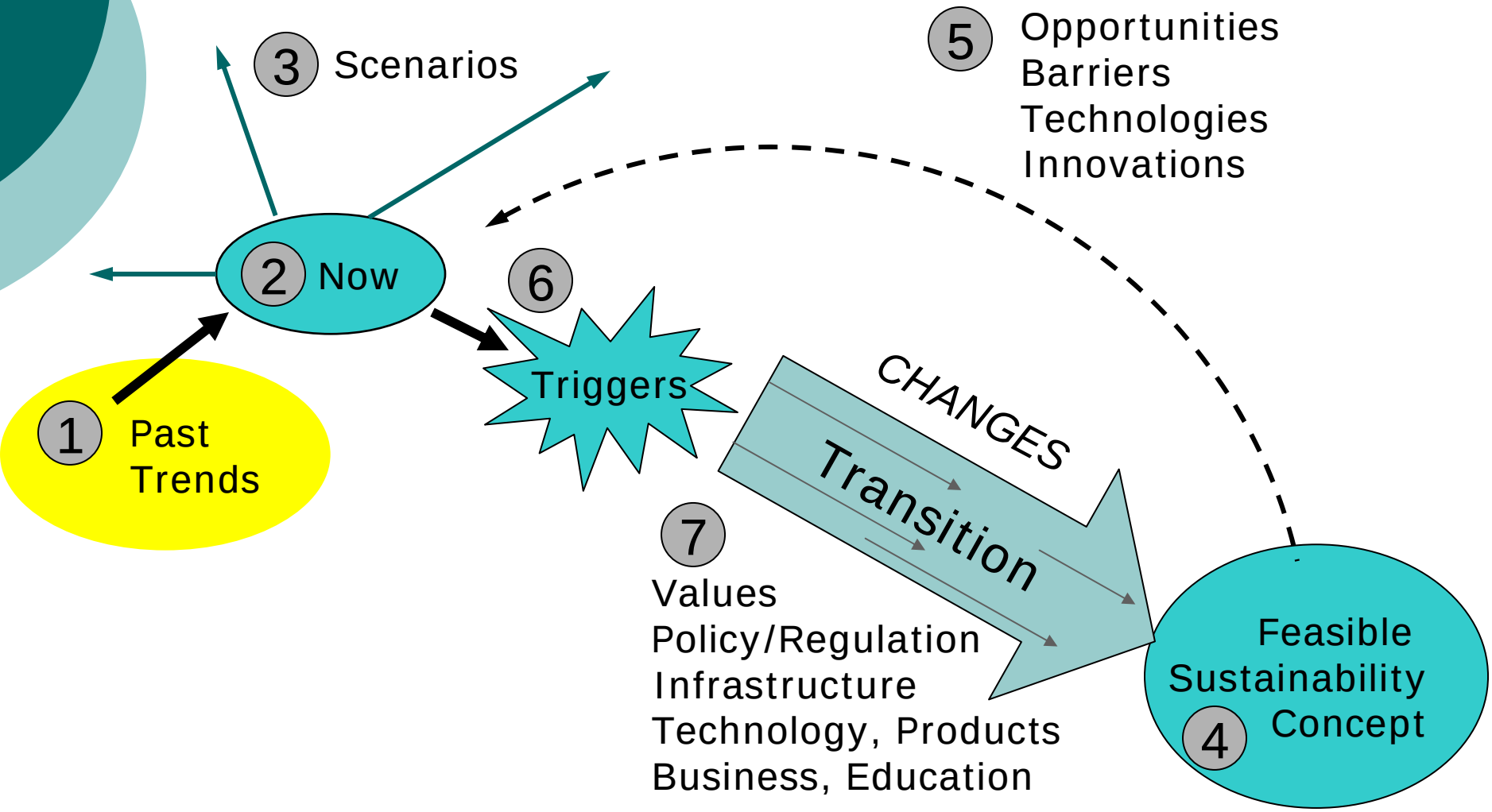


First Rule of Engineering

Know what problem you are working on.

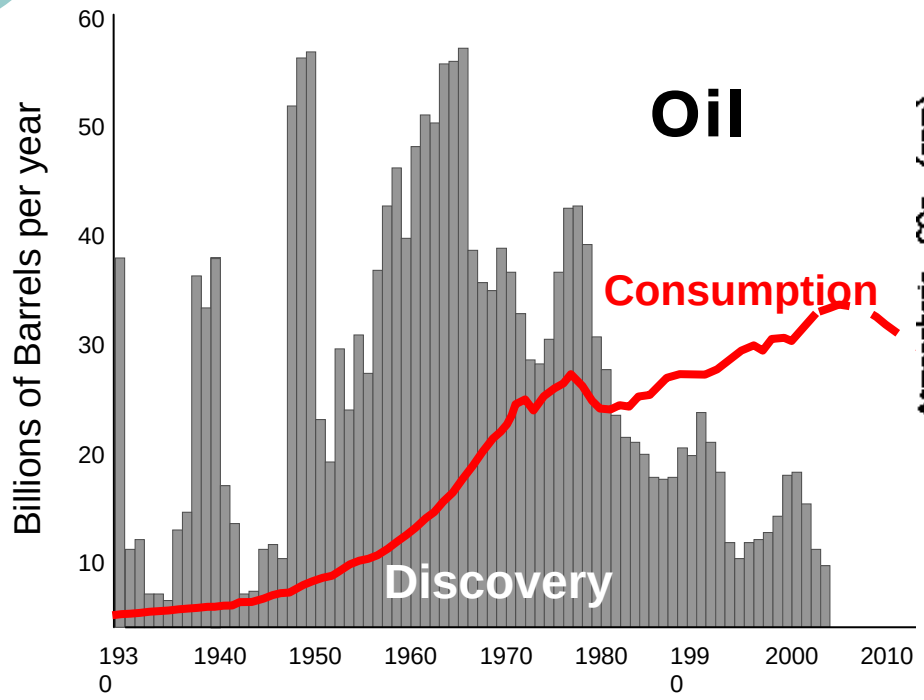
Blind Scholars and the Elephant

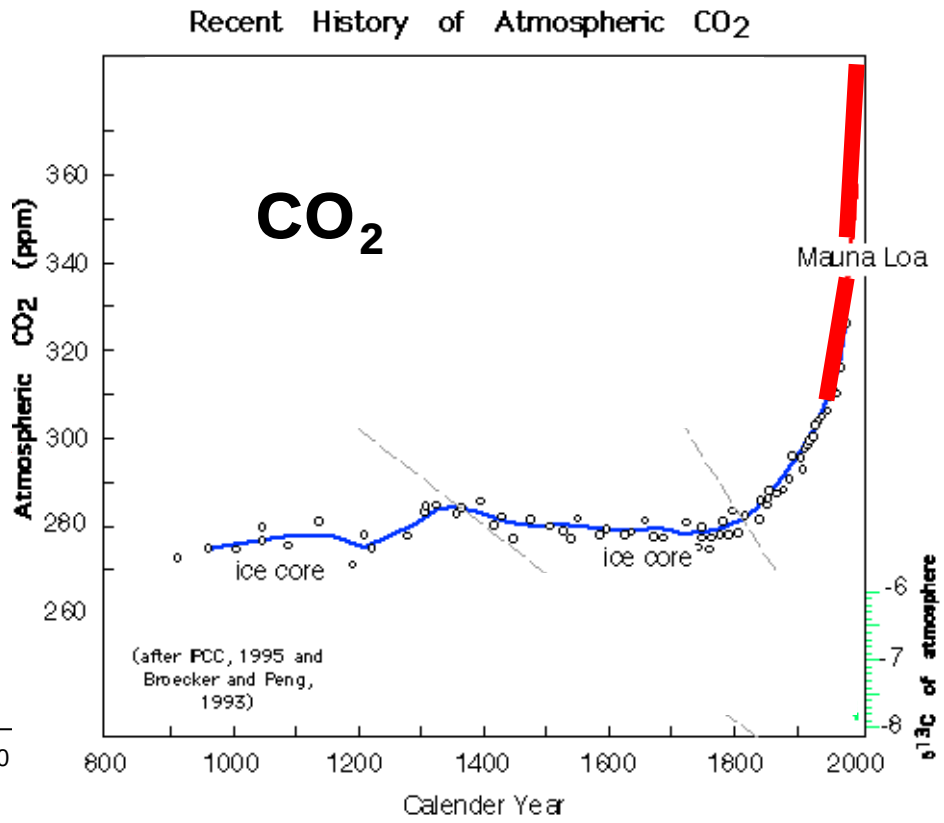
Transition Engineering



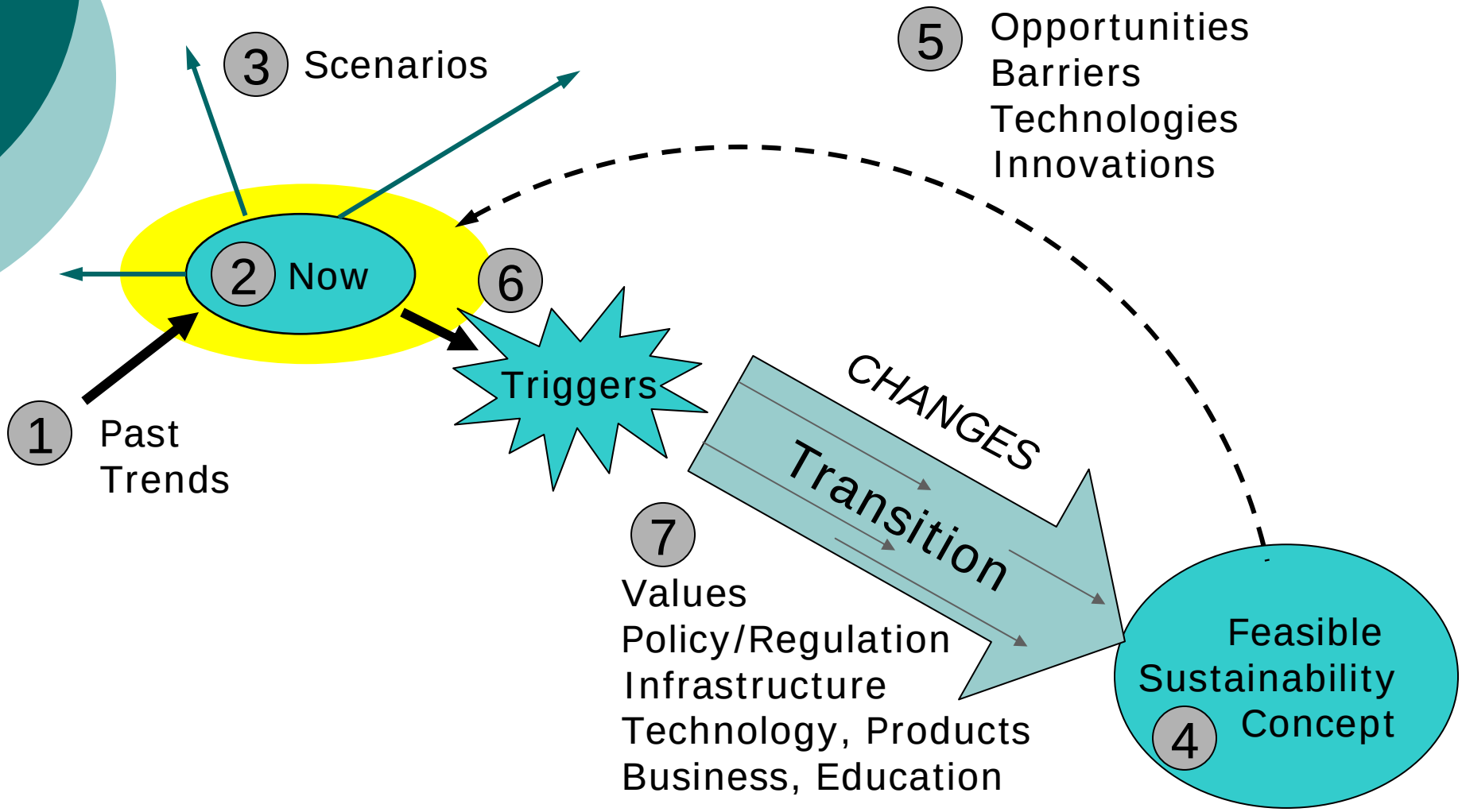
1 - History

- What have we been doing?
- How did we get here?
- What is our response?



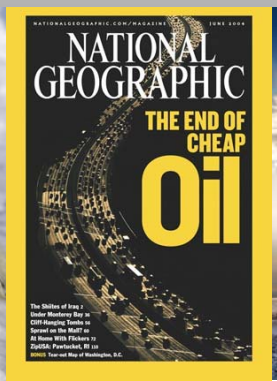


Transition Engineering

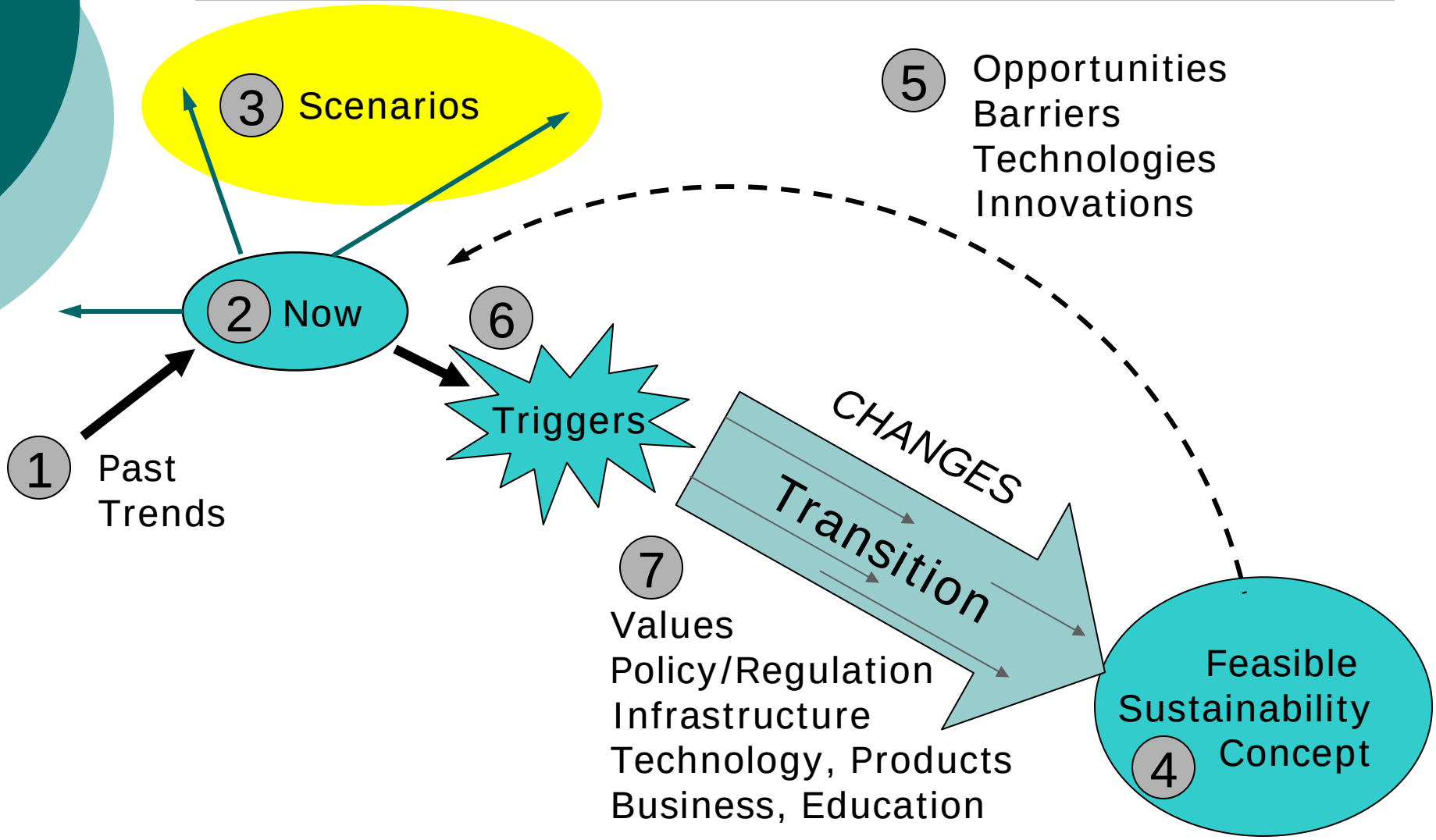


2 - Current Status

- What are we using?
- What are the impacts?
- What are the problems, issues, risks?
- What is un-sustainable?

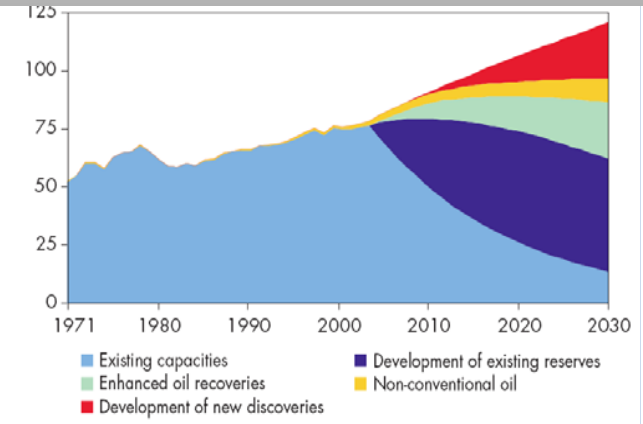


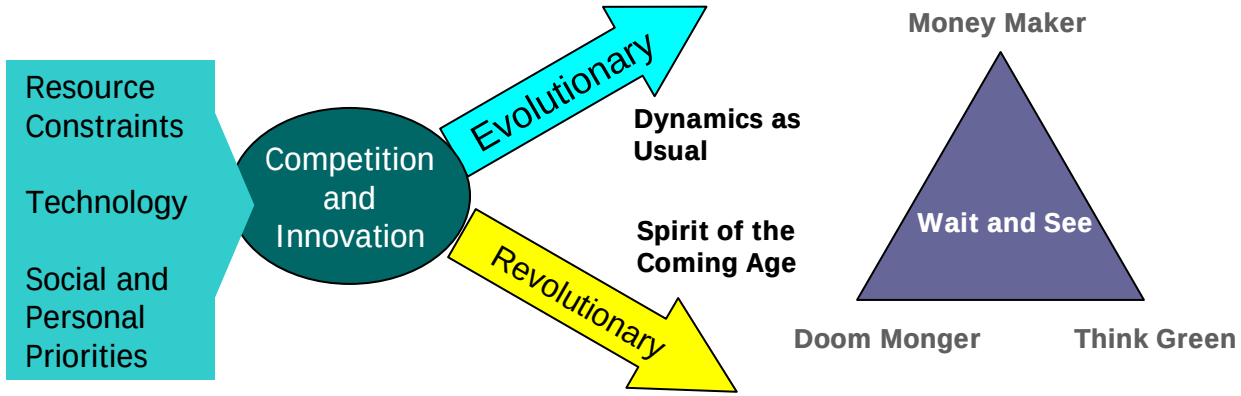
Transition Engineering



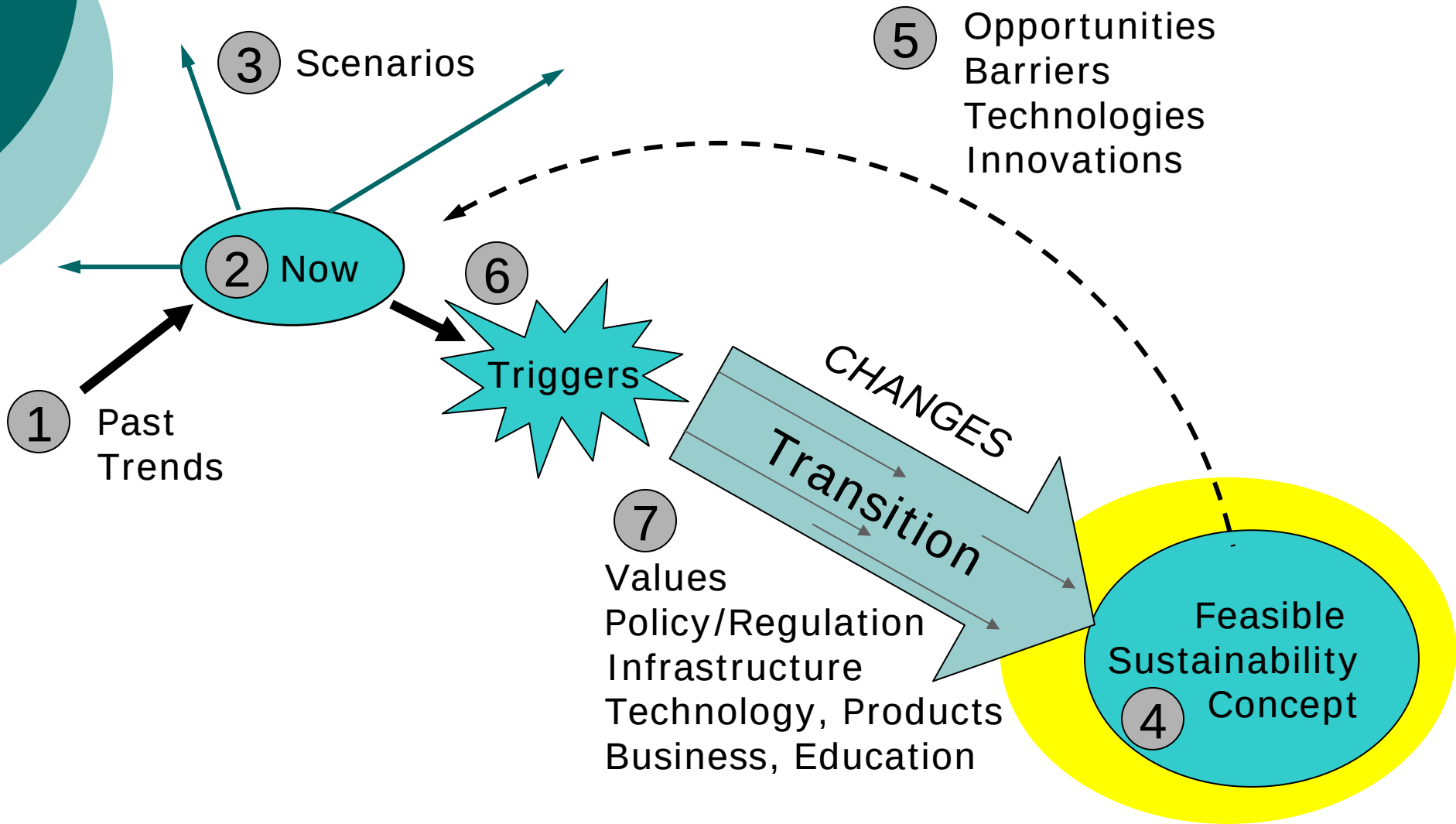
3 - Scenarios

- BAU - Continuing Trends
- Evolution vs Revolution
- Green Economic Growth or Decline
- Break-through Technologies





Transition Engineering

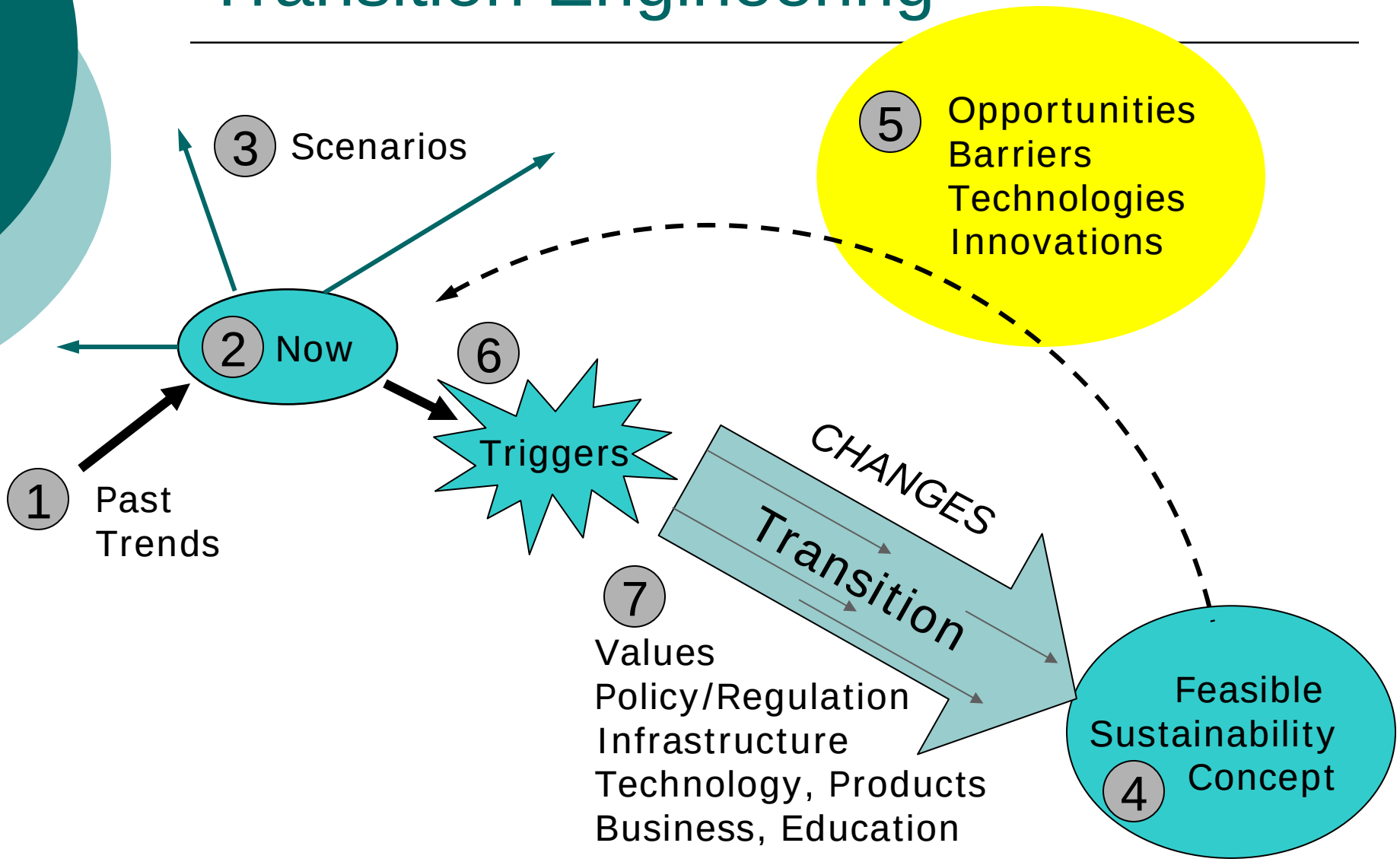


4 - Concept Generation

- Us, but Sustainable
- Free Play, Brainstorm, Vision
- Must be modelled for feasibility

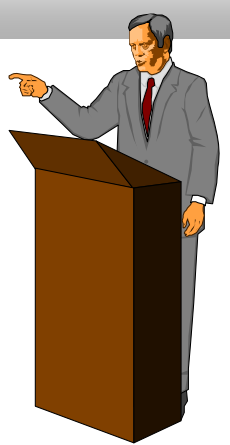
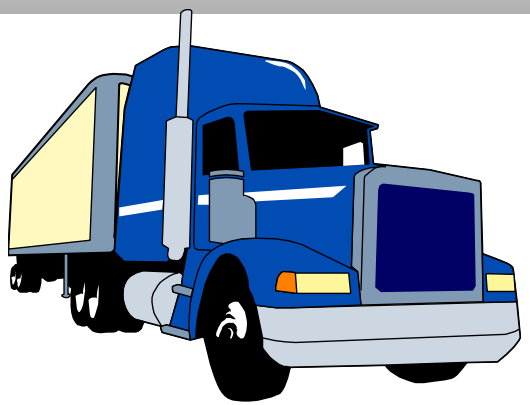
Feasible Sustainability

Transition Engineering

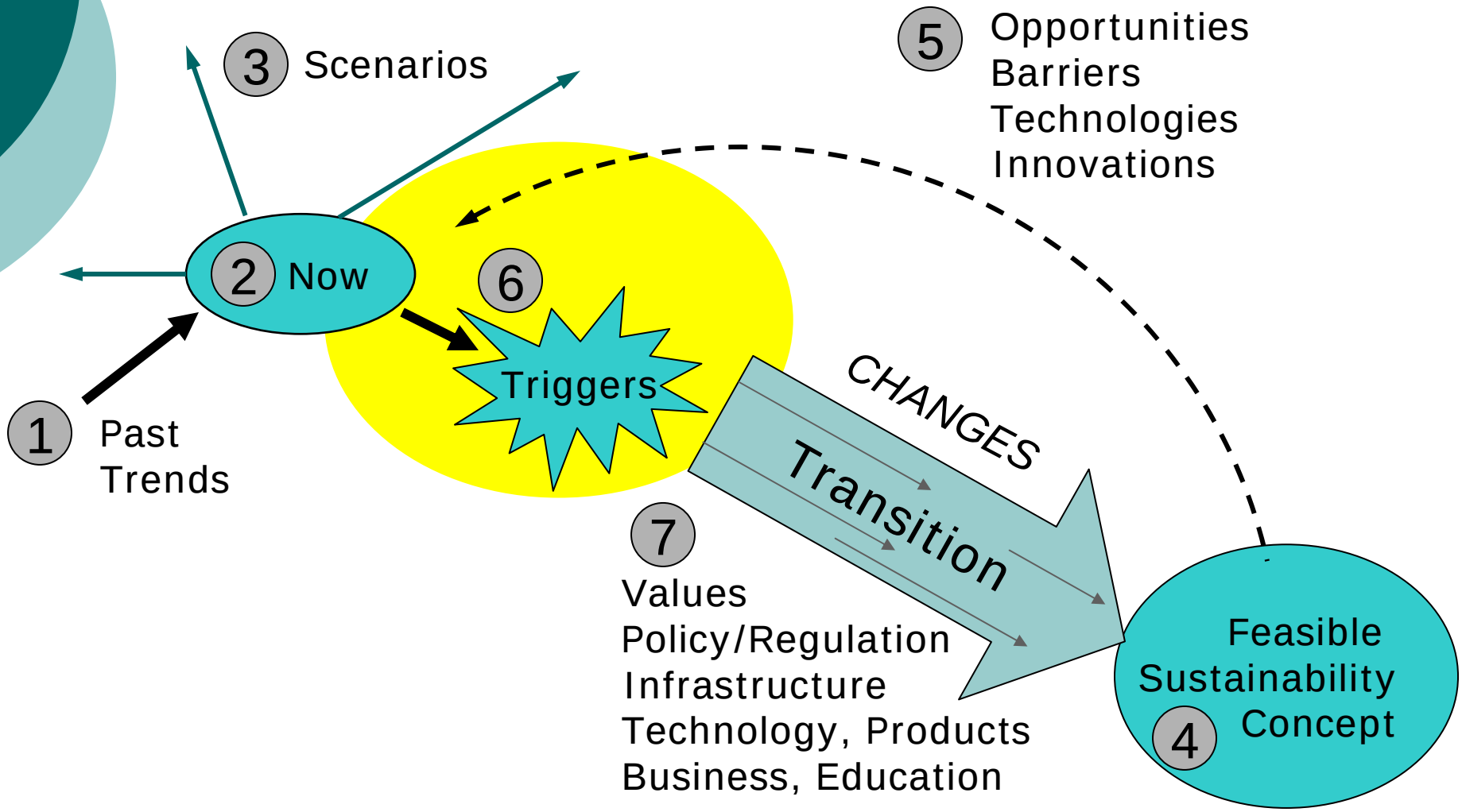


5 - Back Casting

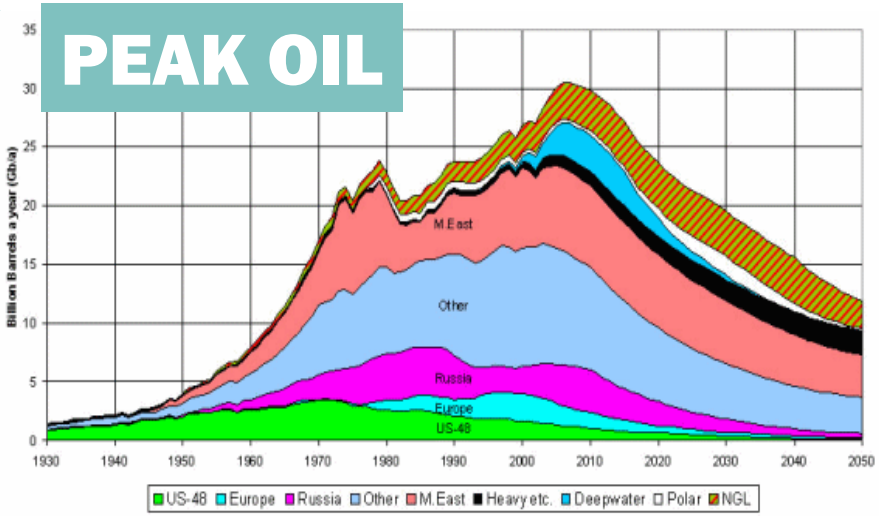
- What are the real differences between us and sustainable us?
- Barriers, Opportunities
- Infrastructure, Technologies
- Markets, Businesses, Values

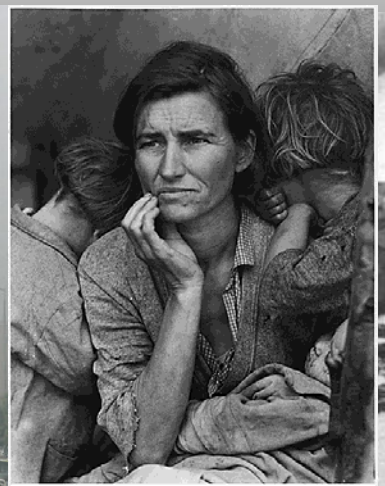
Transition Engineering



6 - Triggers

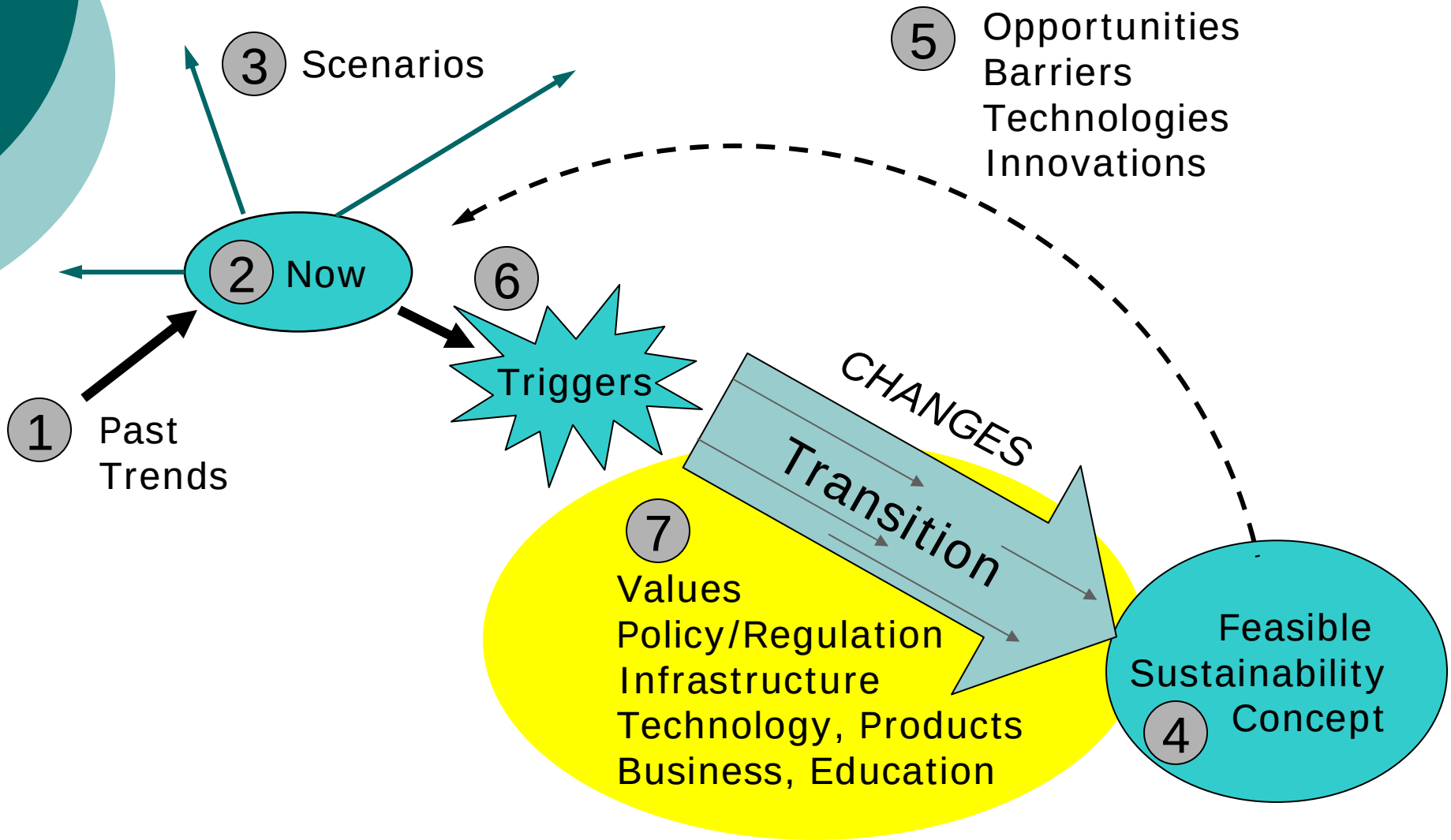

PEAK OIL
Billion Barrels a year (Gb/a)
35
30
25
20
15
10
5
0
1930
1940
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
M.East
Other
Russia
Europe
US-48
US-48 Europe Russia Other M.East Heavy etc. Deepwater Polar NGL

CLIMATE
CHANGE



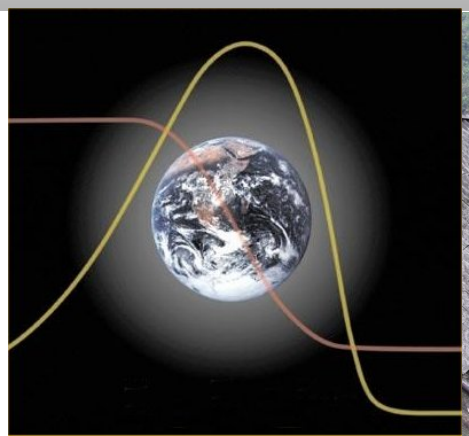
OPEN OUR
FUTURE
NOW
FREEDOM

Transition Engineering

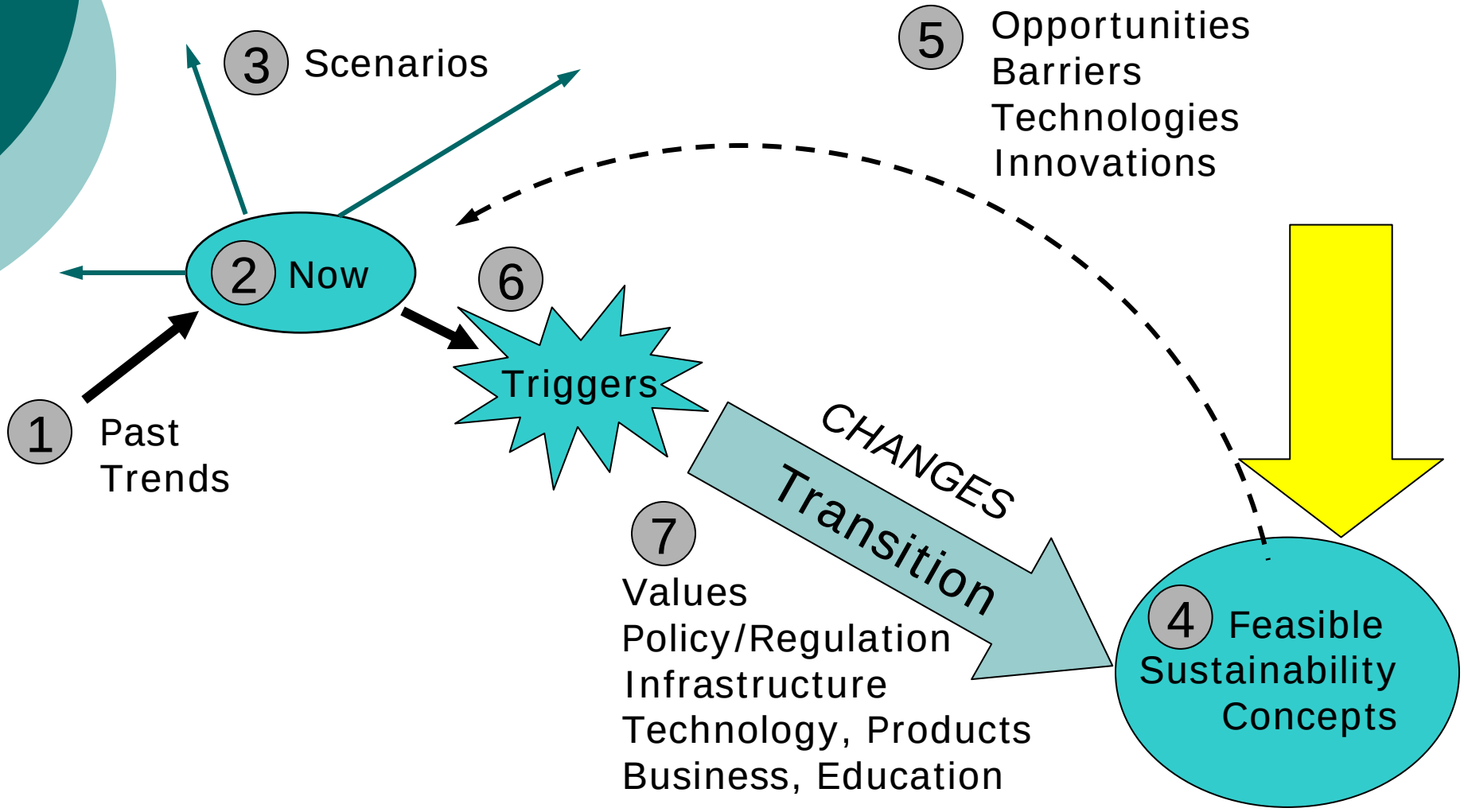


7 - Primary Change Projects

- Risk Management
- Demand Management
- Establishing & Achieving Limits
- Sustained Value



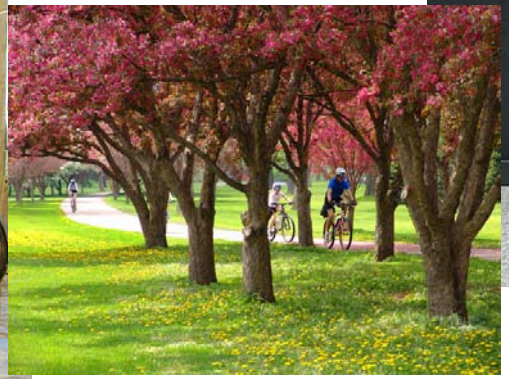
Transition Engineering Projects



Example of Feasible Sustainability

- Vision of reality
- Vision of possibility

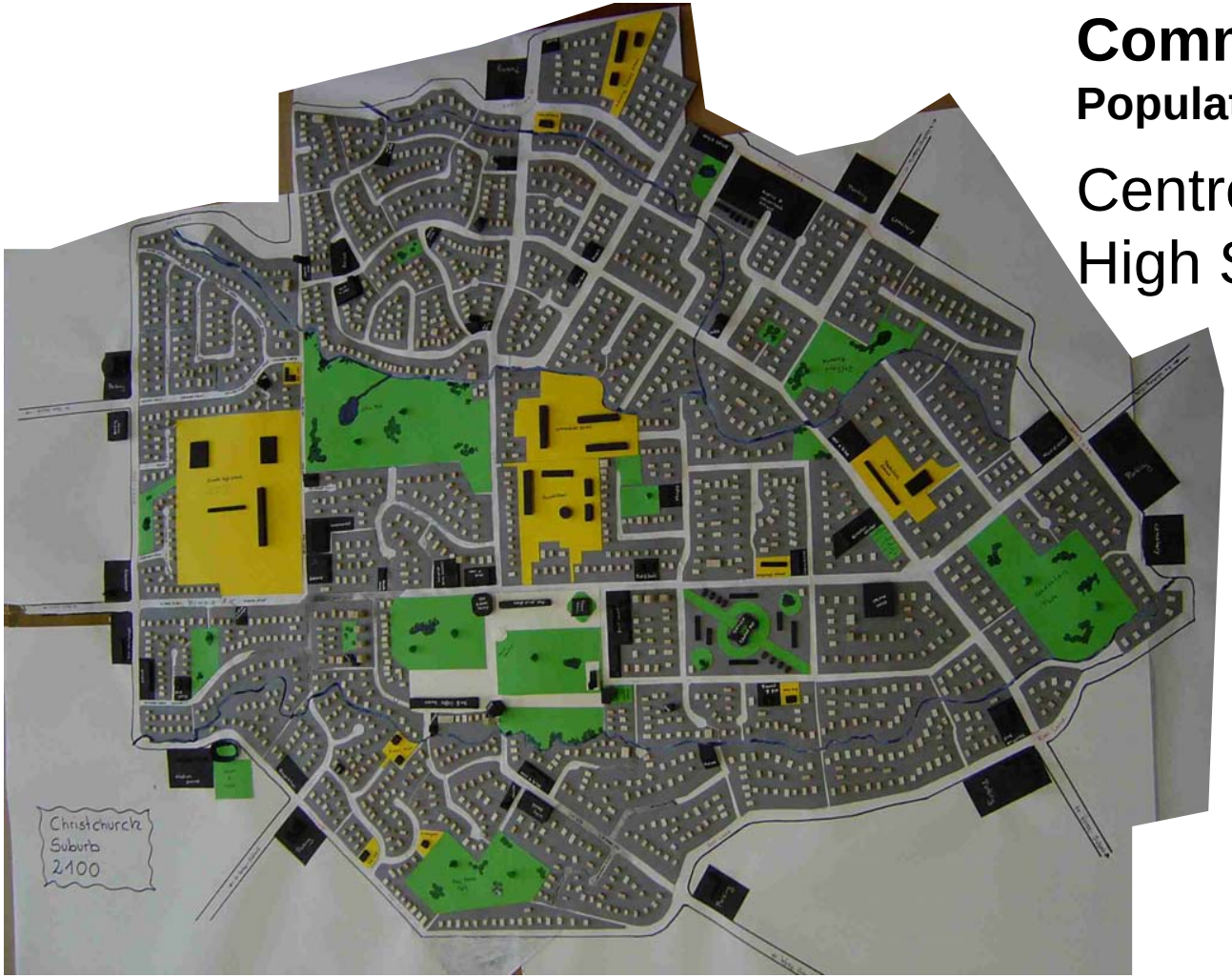
Welcome to *Silke*



Feasible Sustainability

- Start with existing investments
- Inventory services, markets, employment
- Calculate paved, built, soil and natural areas
- Renewable energy and resources only
- Microclimate & production stabilized

Burnside High Zone Community

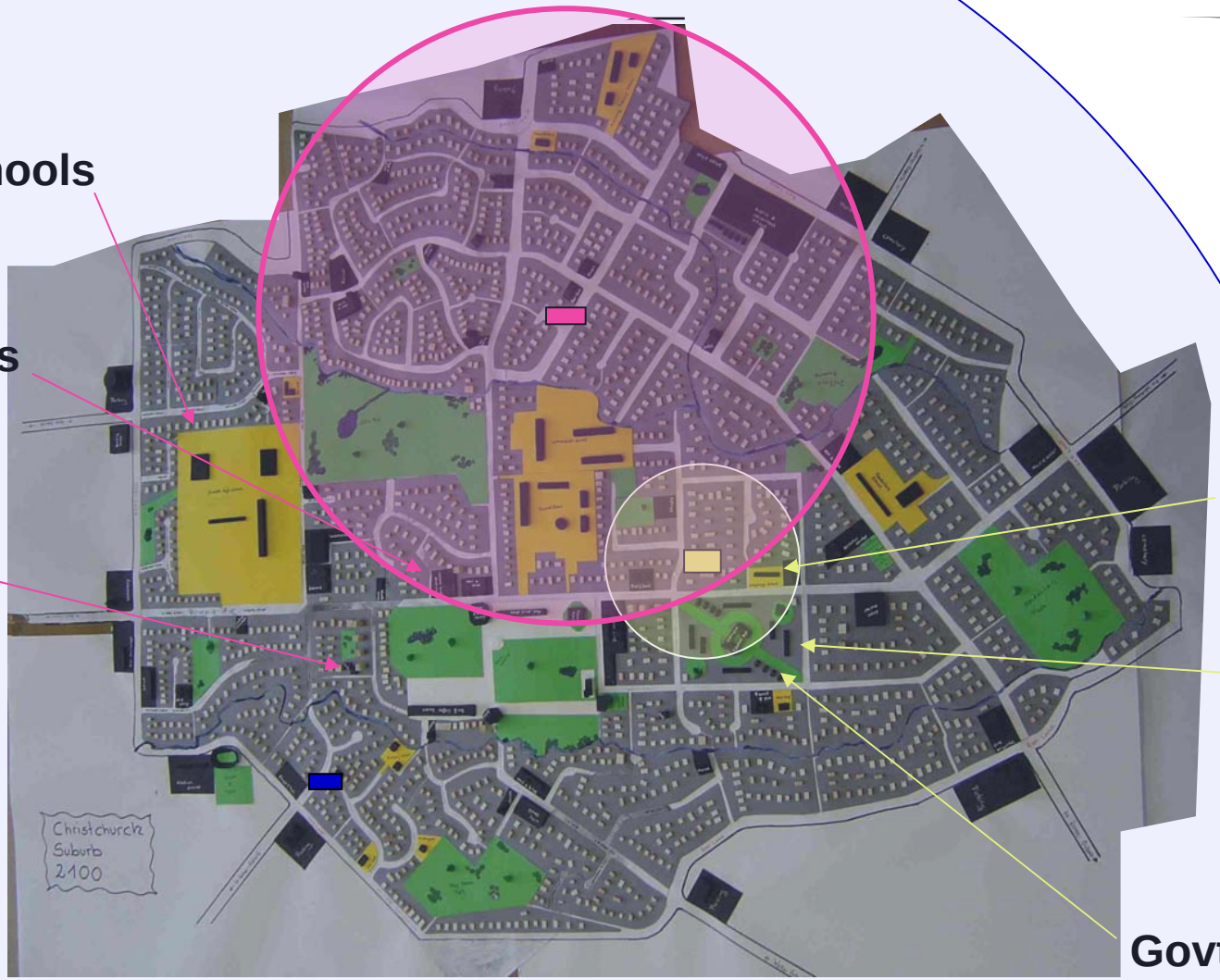


Community Unit

Population: 9000-10000

Centred around High School

Analysis Method



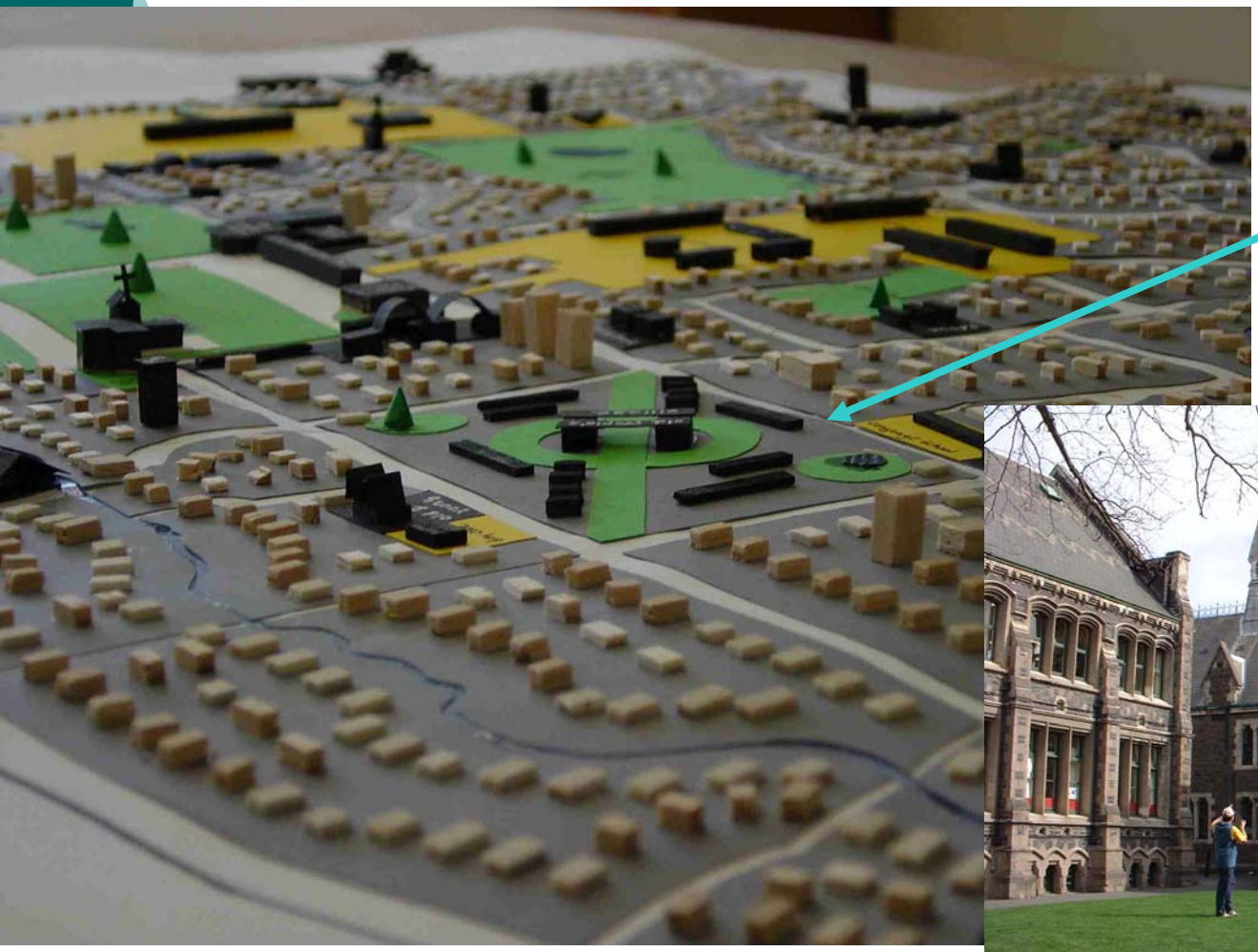
Activity Model

- Motorized transport available for
  - Goods
  - Emergency Services
  - Public Transport
- 95% of Activities accessible without motive power
- 95% of goods and services present in the zone
- 85% of employment in the zone

Urban Form Transition #1

Opened up Fencing for pedestrian accessibility

Local Organization and Services

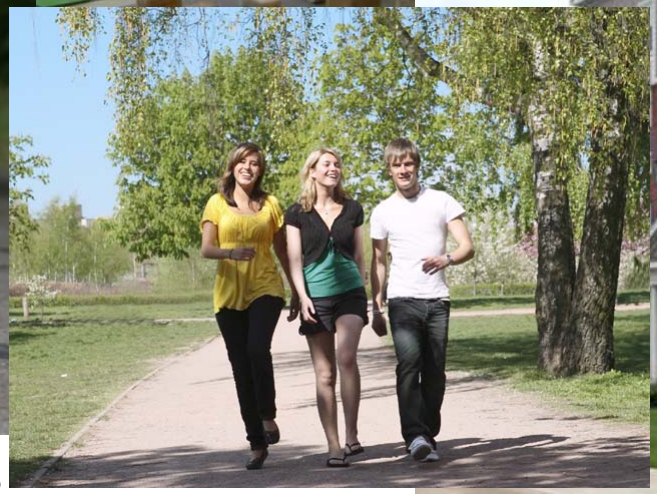


10% of homes moved to make room for Town Center

Housing and Community

1/4 Acre family housing density

10% high density housing



Integrated Communities

30% of land area Native Species

Stream corridors, wetlands, walking corridors and reserves in native bush

Integrated Food Production

- Reclaimed paved space

55% of fresh produce, dairy & poultry grown within the urban form

Zero Food Miles

Meaningful Work

Basically same old…

Teaching

Professional

Trades

Bakery, Cafe

Services

Meaningful Work

Some New Features

- *Consumption and waste material flows very low*
- *Ideas and knowledge flows very high*

Energy Service Management
Ecology Management
Master Gardeners

Micro-Processing

Micro-Manufacturing

Transport – Primarily Goods

Delivery and Emergency Access

Walk or Bike to Town Center

Inter-Zone Trolley

Zone Orbiter Shuttle

Vision of Feasible Sustainability

- Vision of reality
- Vision of possibility

Questions?