

Navigating the 21st Century

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20TH CENTURY TRENDS CONTINUE

Emergence of a global common market

Increasing industry consolidation

Shift to external sources of expertise, capabilities and large scale operations

Rise of emerging powers, especially BRIC

Increasing growth of urban areas into rural land

Rising average age in developed countries/older first time parents

More consumers trading up to selected premium products and financing it by trading down in others

Global obesity epidemic with increasing awareness of nutrition

High demand for product safety and traceability

YOU CANNOT UNDERSTAND THE FUTURE UNLESS YOU UNDERSTAND THE PAST

During an **era** population density is constrained by the environment resource

Environment comprises the physical environment together with the technology that is being used to exploit it

When a fundamental new technology – ‘agriculture’ or ‘industrialised agriculture’ – is developed the size of the environment increases

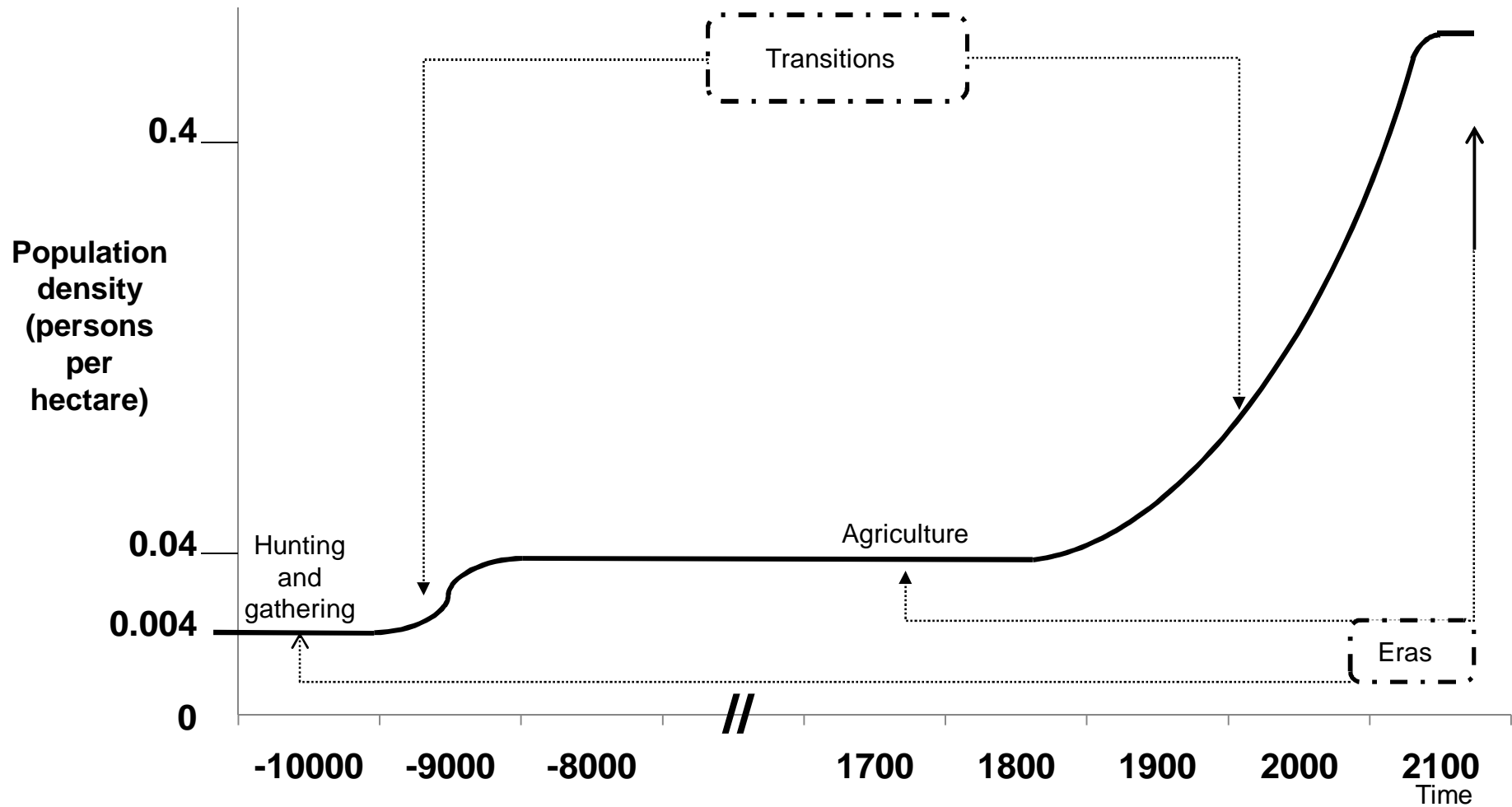
To understand this point, think of a physical fish resource 10 km off the coast. It is only an environment resource when a fishing boat technology is available

When a fundamental new technology is introduced the environment resource increases and the population increases

The period of population increase is a **transition**, and we are in the transition between the agricultural era and the industrial era

The economic theory that guides our policy has been developed within the transition to explain transition processes. It does not tell us much about what happens when the transition ends

ERAS AND TRANSITIONS



END OF TRANSITION – ENVIRONMENT BECOMING A CONSTRAINT AGAIN

Rising cost of food production

Scarcities of land and water

Ecosystems collapsing

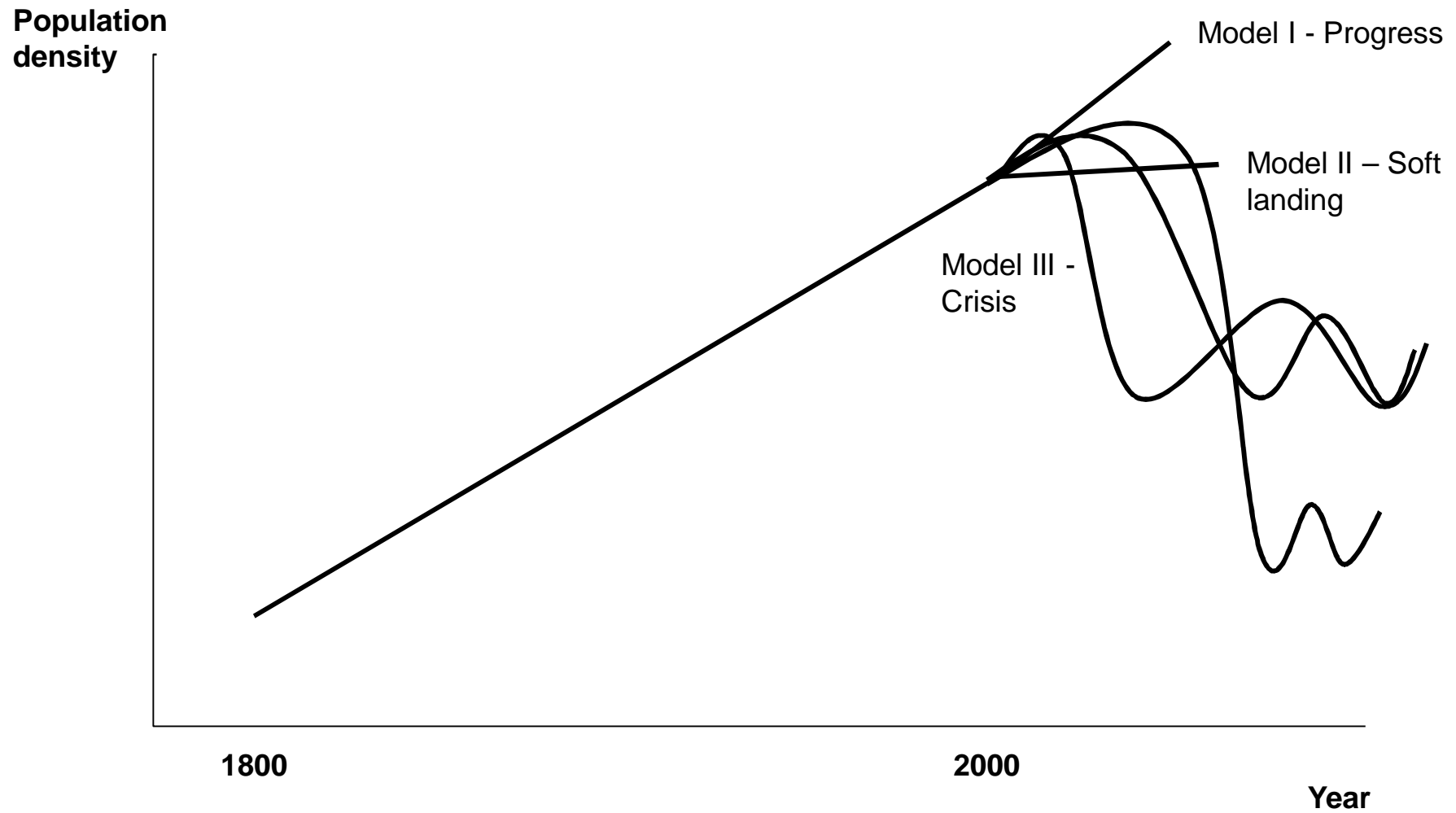
Increasing cost of energy

Strategic resource security becoming an agenda item

Businesses and governments pursuing sustainability – “green growth”

Growing cost of environmental regulations

ALTERNATIVE FUTURES



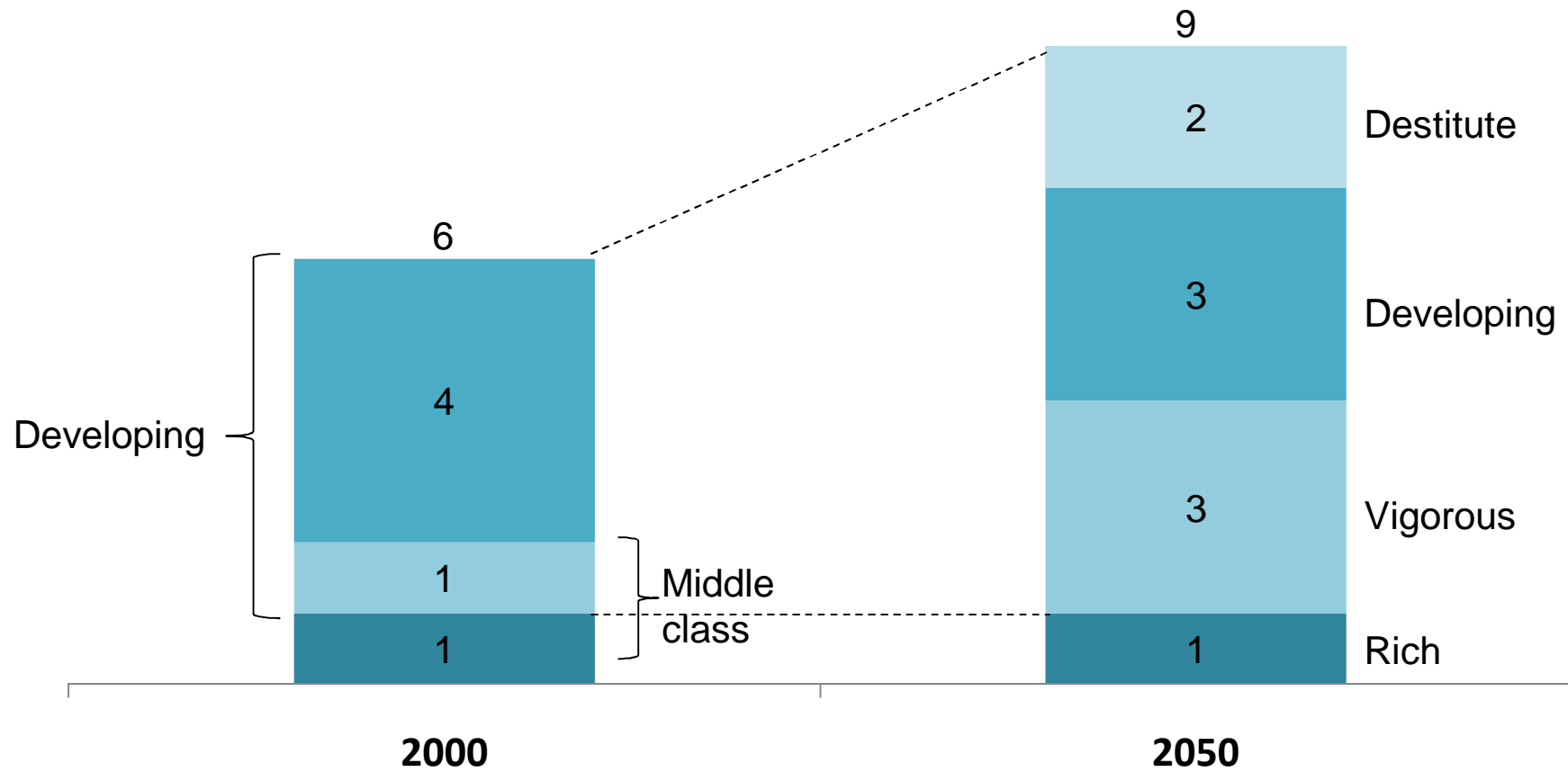
WHAT CARRYING CAPACITY AFTER THE OVERSHOOT?



WHAT'S DIFFERENT THIS TIME?

1. It is the end of a transition, not just a population growing beyond its resources
2. It is planet-wide so cannot we migrate or start elsewhere
3. The climate is more involved
4. Technology has untapped potential

BUSINESS-AS-USUAL POPULATION



ONGOING TECHNOLOGICAL ADVANCE

Growing computational power, bandwidth and artificial intelligence

Rapid advancement of nanotechnology, smart devices and materials technology

Growing biotech/proteomics market with increasing acceptance and adoption

Increasing understanding of human genes and human biology

Development of foods that are scientifically proven to provide benefits beyond sustenance

Increasing focus on advanced technologies to lift agricultural productivity

Efficient renewable energy

Increasing importance of intellectual property

POPULATION \approx FOOD SUPPLY

No net addition to land in production since the mid-90s

Average yields are being lifted to maximum; diminishing return, yield growth declining

Around 1% of land lost to production each year

Urbanisation and roads, salination, desertification, erosion
plus cereals diversion to bio-fuels and to feed livestock

Reserves lower quality, in tropical forest, wilderness areas, and developed countries

Food prices up 80% since 2000

More people are hungry – from 0.8b to 1.0b in the last 2 – 3 years

Now production and research effort is increasing – what outcome?

Global stocks got low, but have recovered

Food constrained wealthy countries are integrating back up the supply chain

CLIMATE THREATS

Plus two degrees with positive feedback risks climate state changes
<p>Ongoing consumption in rich countries</p> <p>Industrialisation and population growth in developing countries</p>	<p>Albedo reduces because ice surface area shrinks</p> <p>Tundra methane released</p> <p>Aerosols stop cooling</p> <p>Ocean absorption reduces</p> <p>Rainforests turn to savannah and release CO₂</p> <p>Methyl hydrate released from continental shelves?</p>	<p>Large temperature increase (>5 degrees?)</p> <p>Atmosphere pattern (rainfall disrupted?)</p> <p>Ocean currents (much cooler?)</p> <p>Greenland and West Antarctic ice melts (sea level up 12 meters?)</p> <p>Flicker? Weather? Earthquakes?</p>

GLOBAL CONSEQUENCES

1. Substantial climate change is now inevitable; issue is how much and how soon
2. Food, water, resources, land become more important constraints
3. Failed states (and piracy is back)
4. Migrations, fences, walls
5. Potential for conflict; but it must be contained
6. Rich will be further separated and protected from the poor
7. Technology will continue to develop, but not be available to all
8. Hard to see how population will get to 9b
9. Environment will continue to deteriorate as people exploit it to subsist; land degradation, depletions and extinctions, etc.

Already happening!

NEW ZEALAND CONSEQUENCES

Some benefits and strengths	... but also serious threats
<p>Terms of trade for food exports likely to continue improvement</p> <p>Relatively well protected from the worst risks</p> <ul style="list-style-type: none"> High quality land and low population density Less affected than average by the direct effects of climate change (initially wetter in the west, dryer in the east.) <p>Appeal to migrants and investors increases</p>	<p>High costs to mitigate and/or adapt</p> <p>Consequences of climate change in other parts of the world</p> <p>Exposure to serious direct effects of climate change here</p> <ul style="list-style-type: none"> Climate Weather Sea level <p>Security</p>

SUCCESS REQUIREMENTS

1. Dramatically increase resource use efficiency
2. Entrepreneurship and technology (for prosperity, capital, capability, productive resilience)
3. Develop new economics, and institutions to guide policy-making
4. Change what we value – risk, environment, others
5. Ensure collaboration and community resilience
6. Navigate: anticipate and adapt, and develop ‘no regrets’ strategies

Don't move too early?

Don't be surprised!

RETURNING TO HISTORY - WHEN GOVERNMENTS FAIL, WHY DO THEY FAIL?

“In the first stage, mental standstill fixes the principles and boundaries covering a political problem.

In the second stage, when dissonances and failing function begin to appear, the initial principles rigidify.

This is a period when, if wisdom were operative, re-examination and rethinking and a change of course are possible, but they are as rare as rubies in a backyard.

Rigidity leads to increase of investment and the need to protect egos; policy formed on error multiple never retreats. The greater the investment and the more involved in it the sponsor's ego, the more unacceptable is disengagement.

In the third stage, pursuit of failure enlarges the damages until it causes the fall of Troy, the defection from the Papacy, the loss of a trans-Atlantic empire, the classic humiliation in Vietnam

Persistence in error is the problem

Barbara Tuchman

The march of folly: from Troy to Vietnam 1984

PARADIGM CONFLICT

Economic


- Economy is small relative to environment
- With limited exceptions, resources can be taken from the environment and wastes can be released to the environment without adverse consequences
- If environmental issues do arise they can be resolved by seeking substitutes, developing technologies and introducing new market instruments
- Societal objective should be to maximise GDP
- The future will be an extension of the past



**Dominant 20th Century paradigm
(economics, policy and business)**

Ecological

- Economy is large relative to environment
- Resource and waste sink constraints, and accumulated environmental damage threaten output growth and human well-being
- Environmental threats are increasing and responses are insufficient
- Societal objective should be to avoid risk
- The future will be different from the past



**Emerging 21st Century contender
(science, ecological economics
and activists)**