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Sustainability

– Searching for Grand Principles, or Just Looking for Clues at the Scene of the Crime?

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* I am grateful for research assistance from Erick Davidson

Sustainability – ... *meeting the needs of the present without compromising the ability of future generations to meet their own needs* (World Commission on Environment and Development, 1987)

Four Concepts

- 1.** It's all about maintaining human welfare – and generous substitutability of human-made capital for natural resources and efficient inter-temporal markets will take care of the future
- 2.** It's all about maintaining human welfare – but prudent policies to prevent prospective resource crises make sense
- 3.** Sustainability involves commitments to particular environmental entities
- 4.** Sustainability has a local dimension

Justifications for Sustainability Concepts

Sustaining welfare

- Utilitarianism

Commitments to particular environmental entities

- Utilitarian justifications – valuing entities is easy to justify; commitment to them is more difficult
- Many competing non-utilitarian justifications ... most of them arguing from asserted principles of various kinds
 - Intrinsic value
 - Duties
 - Rights

It's all about maintaining human welfare

A closer look at the assumptions (Solow, 1974)

$$Y_t = e^{(a-g)t} f(D_t, K_t, L_t)$$

Y : aggregate output or welfare

D : natural resources, K : capital, L : labor ... and they are very good substitutes in producing Y

a : technological progress, g : population growth

The key result – human welfare can be maintained for a very long time

- even as D diminishes, so long as K accumulates
- so long as a is as great as g

It's all about maintaining human welfare

This kind of thinking provides the foundation for

- Weak Sustainability
- The Hartwick Rule – roughly, welfare is sustainable so long as extraction of exhaustible resources is compensated by commensurate investment in capital or renewable resources
- Green Accounting
 - **Genuine Savings**
 - **Adjusted Net Savings**

Genuine Savings

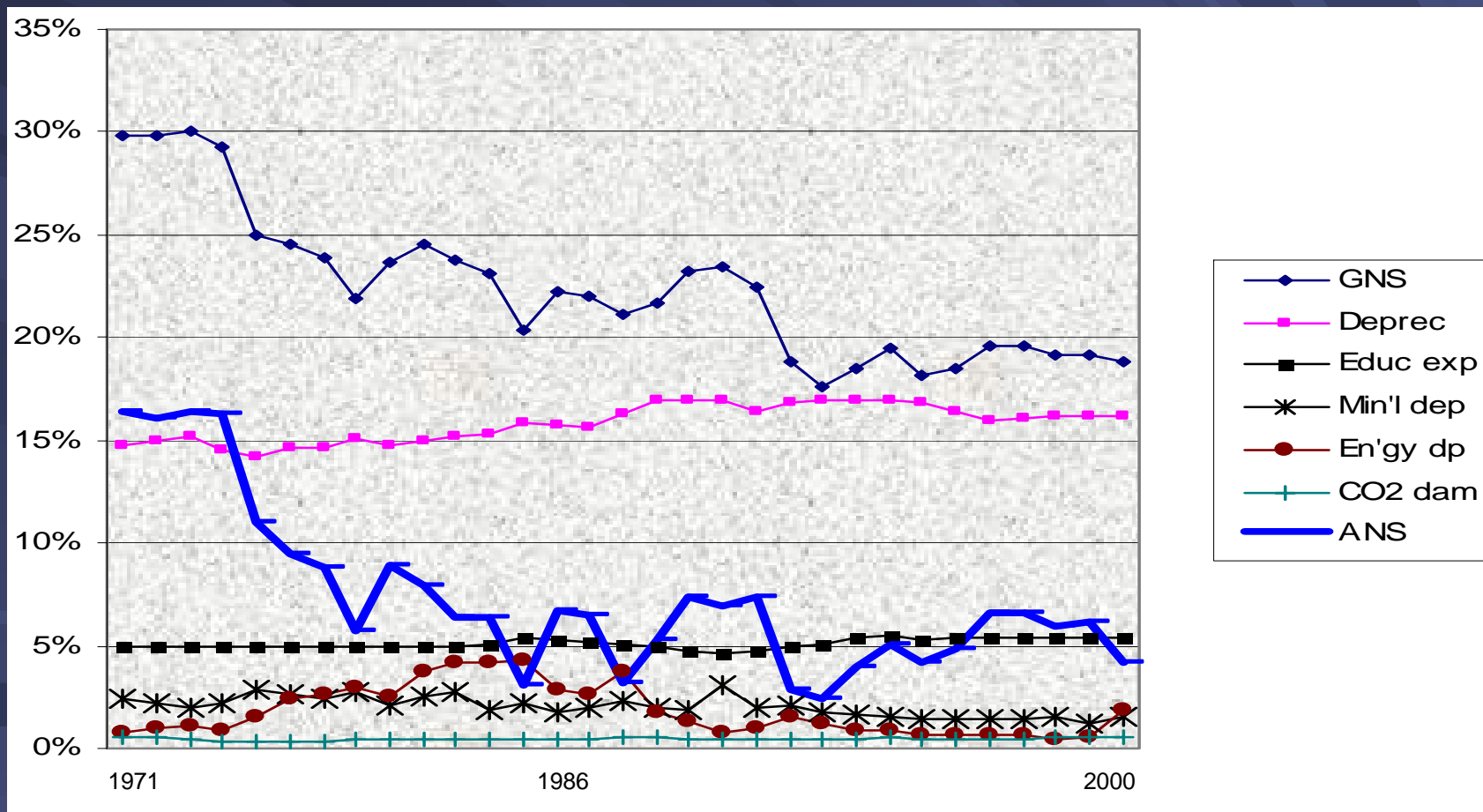
$$G = \sum p_i \cdot \Delta K_i$$

where the K_i include

- gross national saving (+)
- education expenditure (+)
- depreciation
- depletion of minerals
- net depletion of forests
- net depletion of water resources – quantity/quality
- depletion of biodiversity
- net pollution damage (inc. GHG)
- net degradation/enhancement of soil (+, -)

Adjusted net savings

– a World Bank view of Australia



Composition of adjusted net savings, Australia, 1971 - 2000

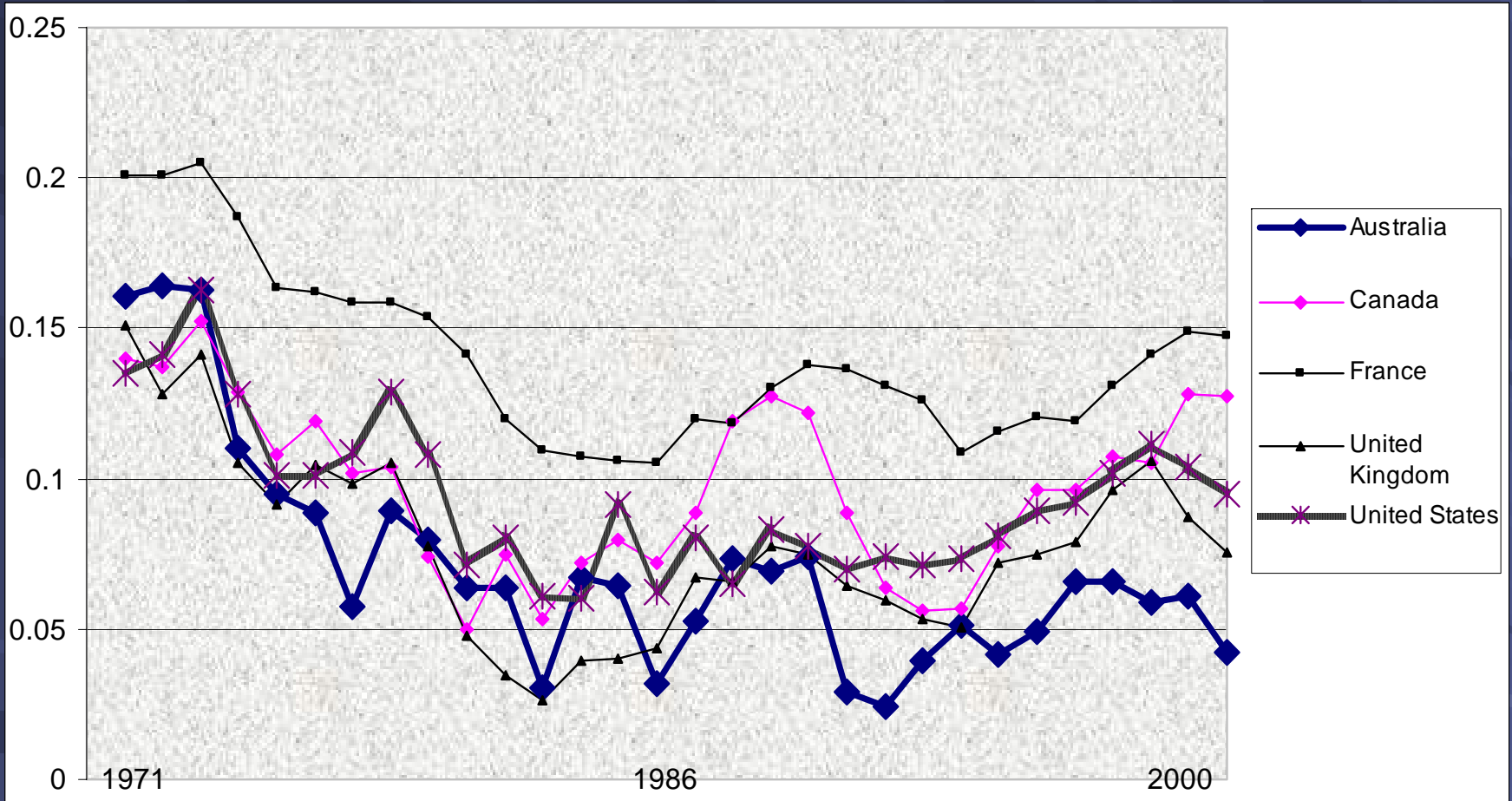
Adjusted net savings predicts future welfare



PV of growth in consumption vs. adjusted net savings, 1980

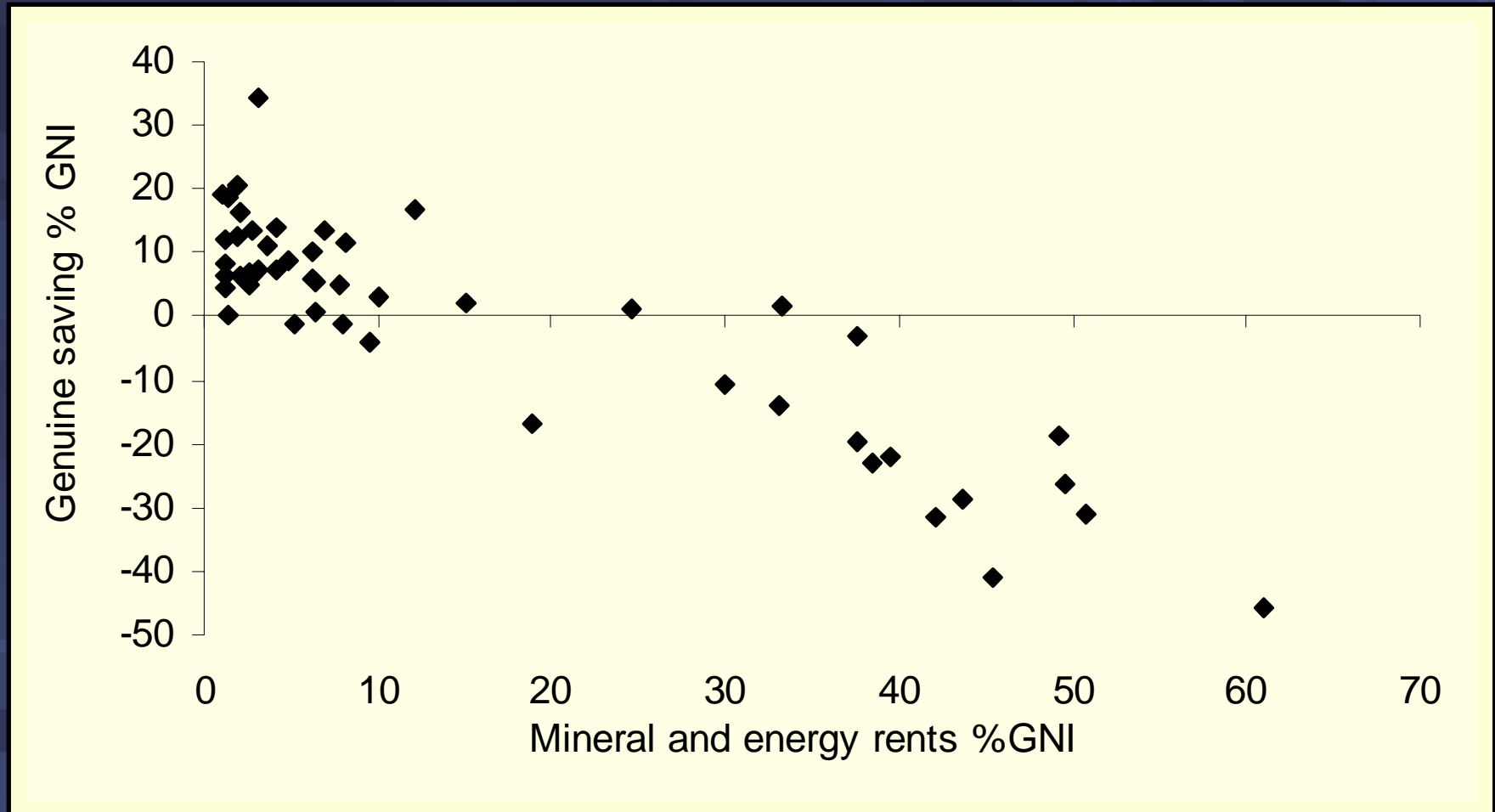
Australia's adjusted net savings

– low among rich countries



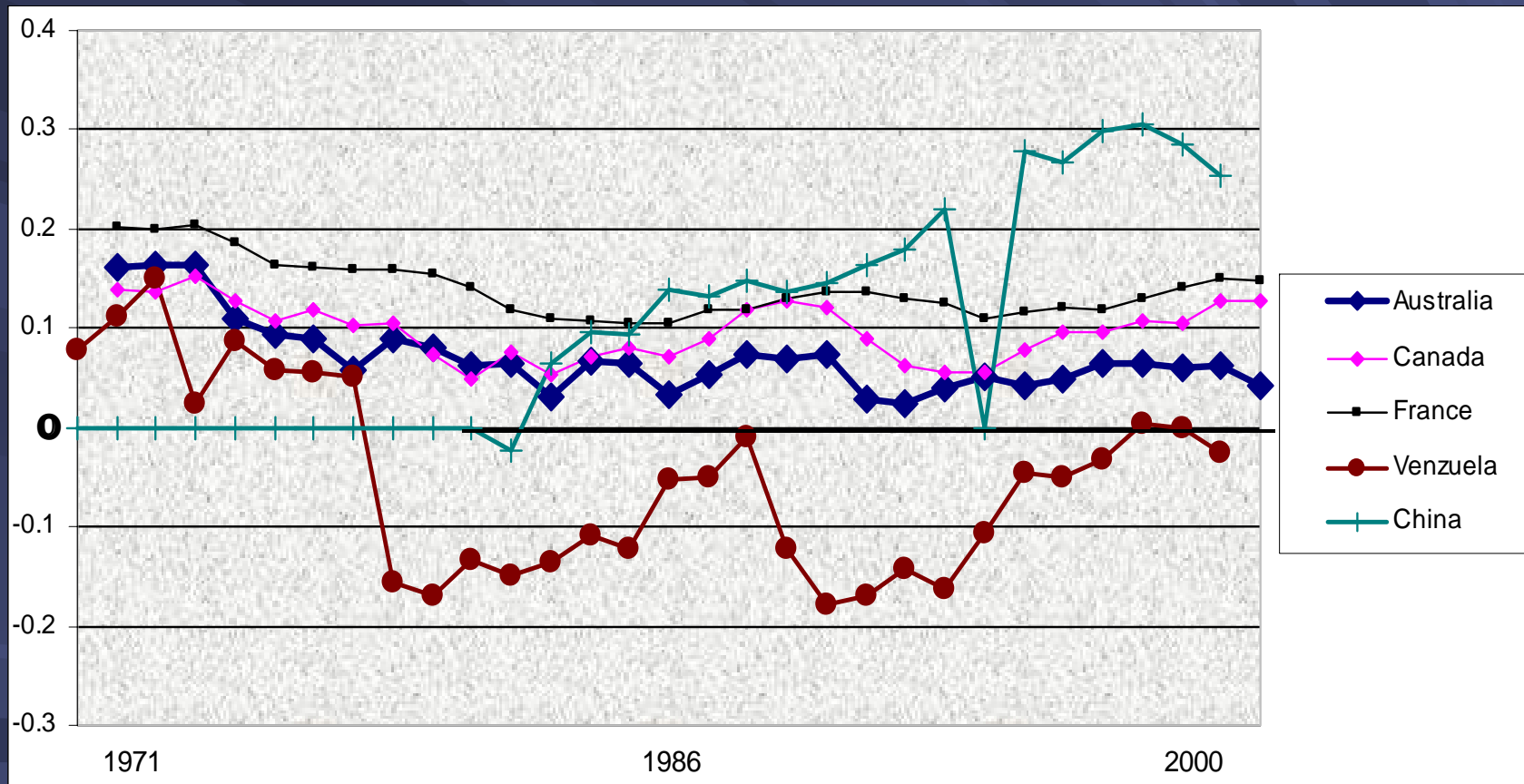
Adjusted net savings – 5 country comparison 1971 - 2000

Countries dependent on exhaustible resources tend to have negative adjusted net savings



Adjusted net savings vs. exhaustible resource dependence

Countries dependent on exhaustible resources tend to have negative adjusted net savings



Adjusted net savings – China & Venezuela included, 1971 – 2000

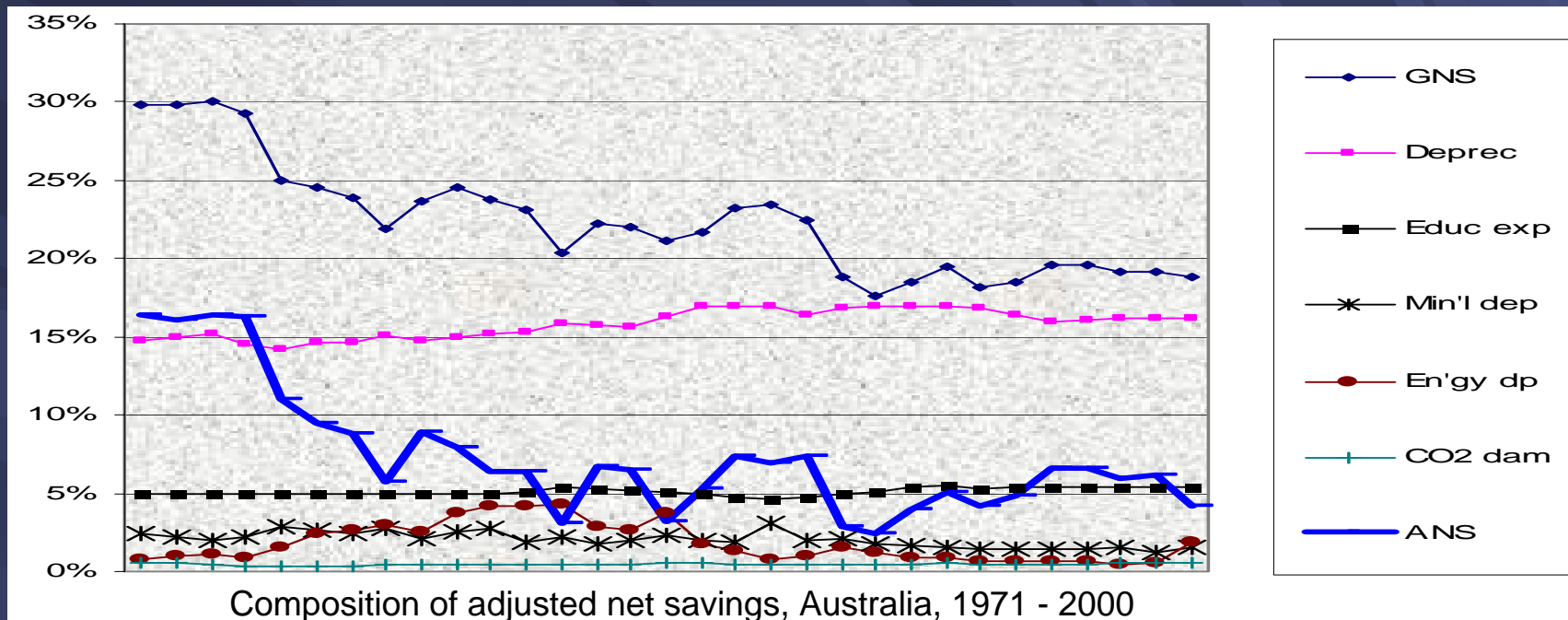
So, from a weak sustainability viewpoint ...

Available ANS data suggests that Australia is muddling along ...

- doing better than many resource exporting countries (the negative savers)
- but not so well as Canada, which seems similarly situated

But, ANS data is incomplete in some important respects

Adjusted net savings – what's missing?



- net depletion of water resources – quantity/quality
- depletion of biodiversity
- net pollution damage (except CO₂)
- net degradation/enhancement of soil (+, -)

We might track these missing items because

... we want more informative Green Capital Accounts

or because

... we worry that prudent resource-specific conservation policies might be necessary, in the cases of certain key resources

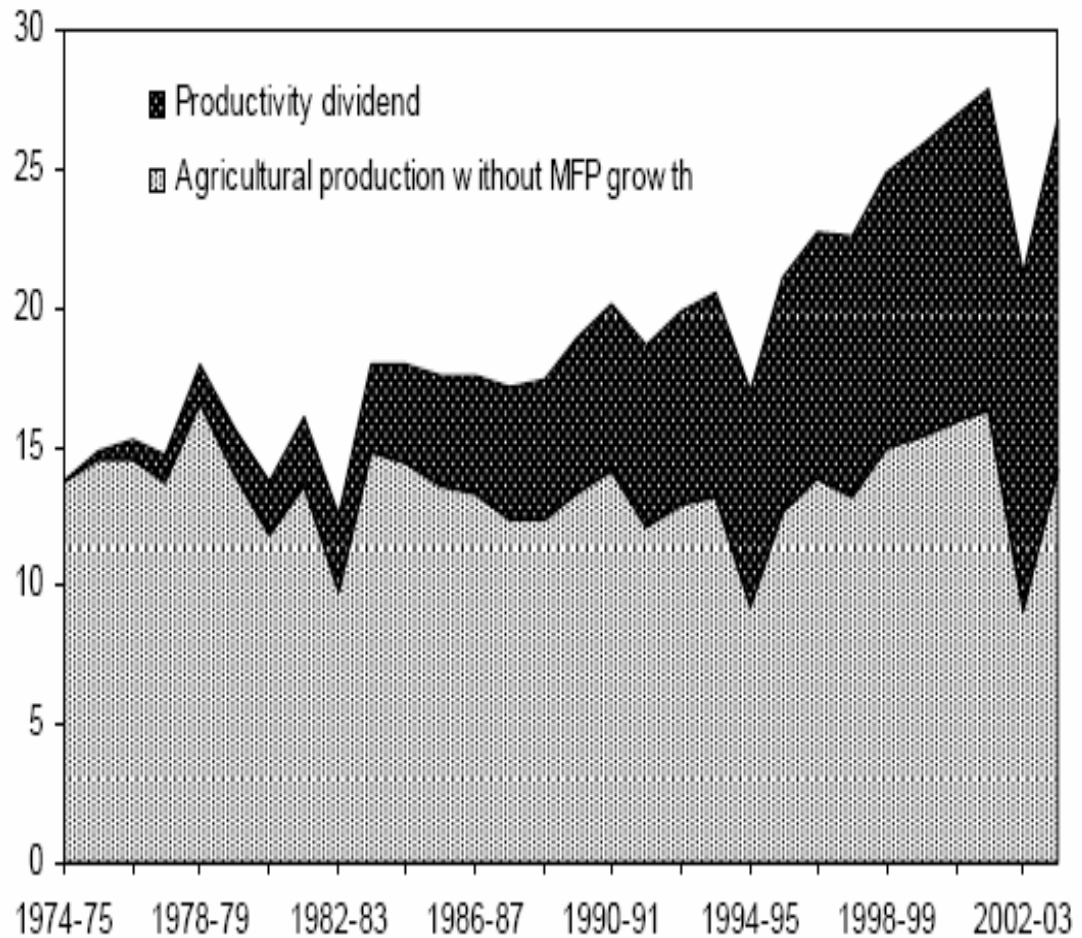
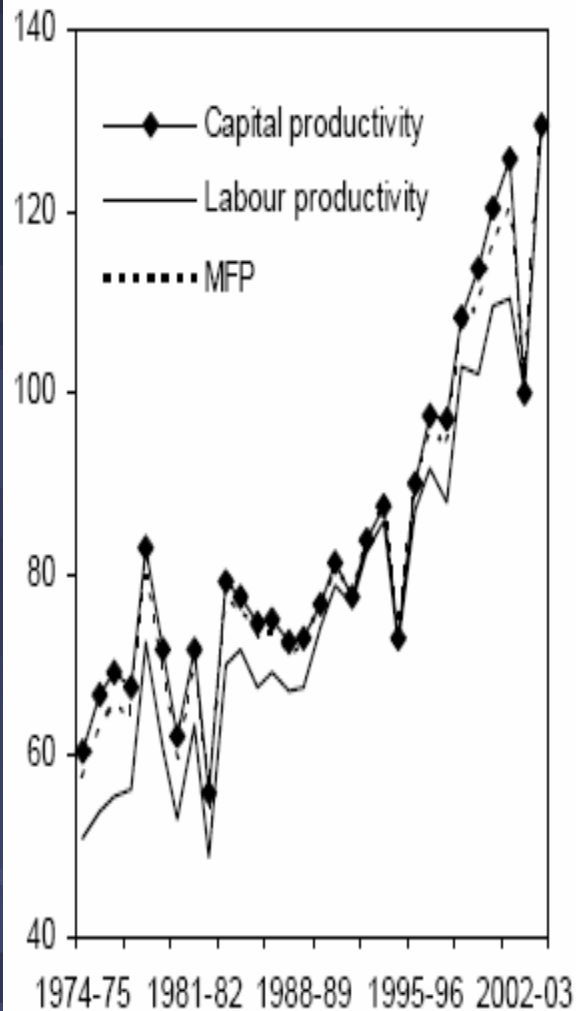
If these policies are simple corrections for market failure, we would still be in the realm of Weak Sustainability

But if more is required than getting the prices right, that may take us down a Strong Sustainability track

We might consider whether resource-specific conservation policies are needed for

- depletion of water resources – quantity/quality
- depletion of biodiversity
- degradation/enhancement of soil

Productivity of agriculture is increasing

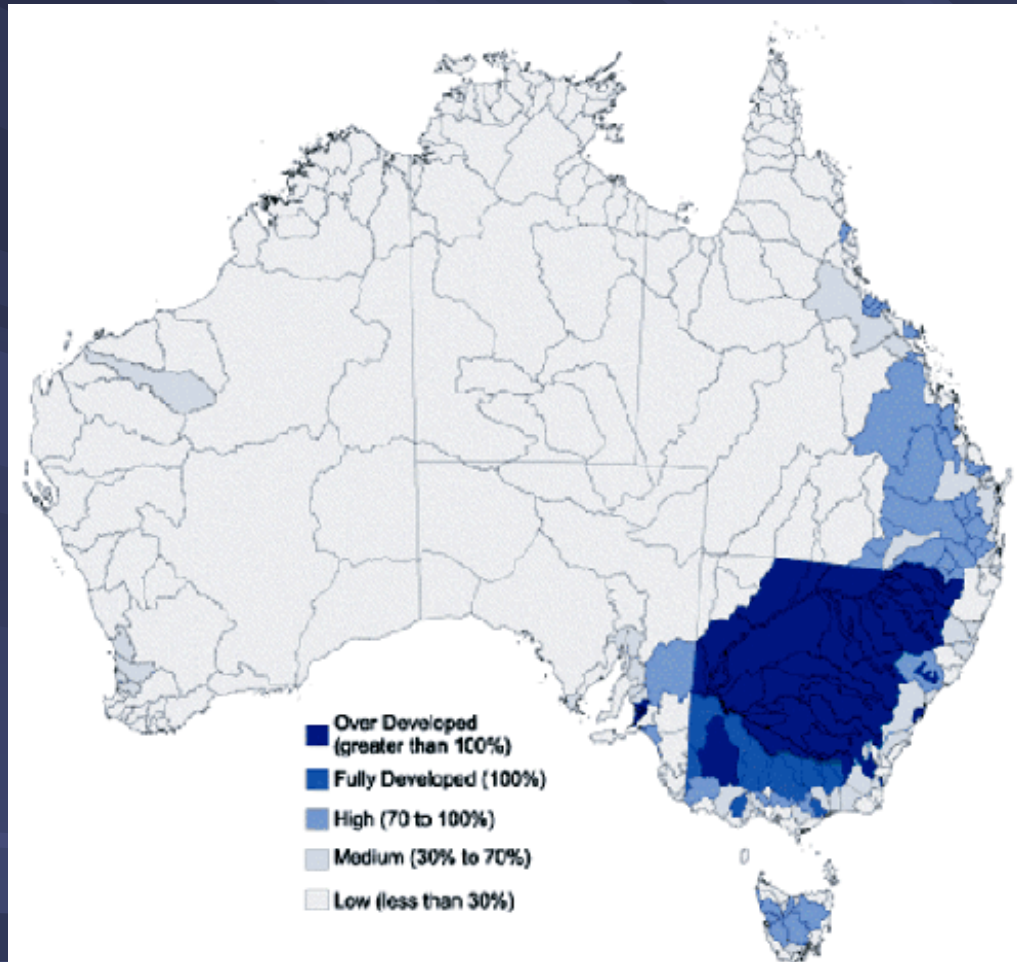


But at what resource/environmental cost?

Agriculture – a more complete accounting

Asset Category Accounting term	Land asset	Other environmental assets
Change in stock	<ul style="list-style-type: none"> ■ Soil erosion, degradation, enhancement ■ Loss, gain of habitats, species 	<ul style="list-style-type: none"> ■ Water abstraction ■ Exhaustible resource abstraction
Change in stock	<ul style="list-style-type: none"> ■ Degradation, improvement of landscape amenities 	<ul style="list-style-type: none"> ■ Air pollution (inc. dust and allergens) ■ Water pollution
Flow of environmental services	<ul style="list-style-type: none"> ■ Landscape amenities ■ Land-based biodiversity services 	<ul style="list-style-type: none"> ■ Nuisance (noise, odor) ■ Waste generation

Overdevelopment of surface water – allocation

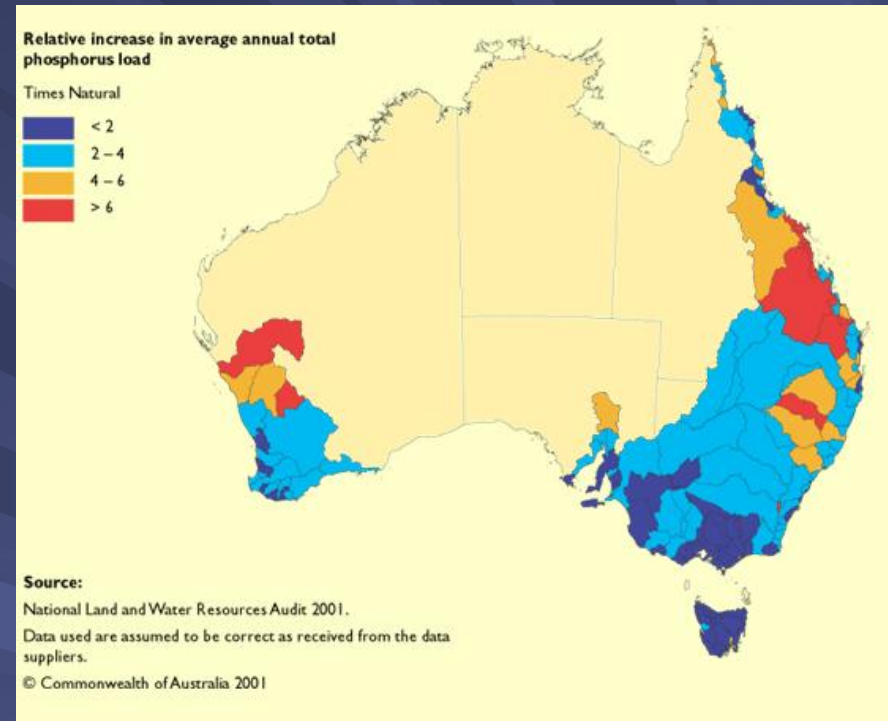
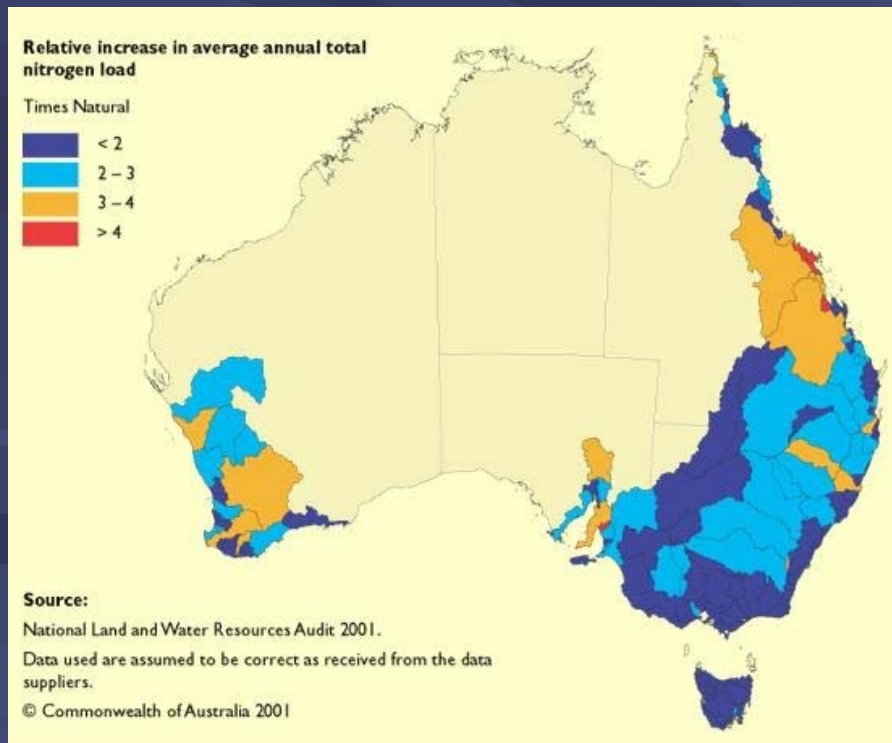


Region	Allocation (%)
Australia	93
South Australia	101
Northern Territory	97
Queensland	93
New South Wales	92
Australian Capital Territory	96
Tasmania	110
Victoria	94
Western Australia	77

Total consumption has increased 65% in ~ a decade

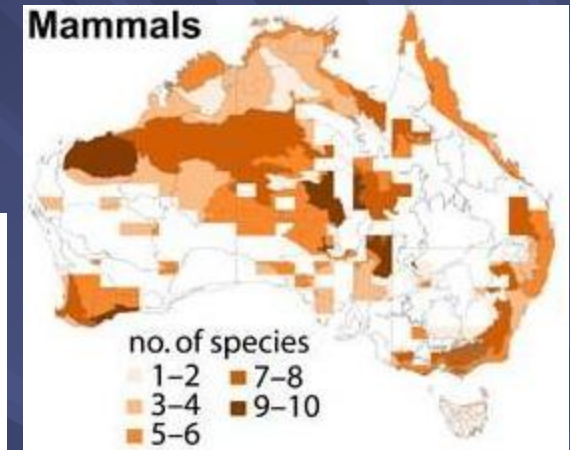
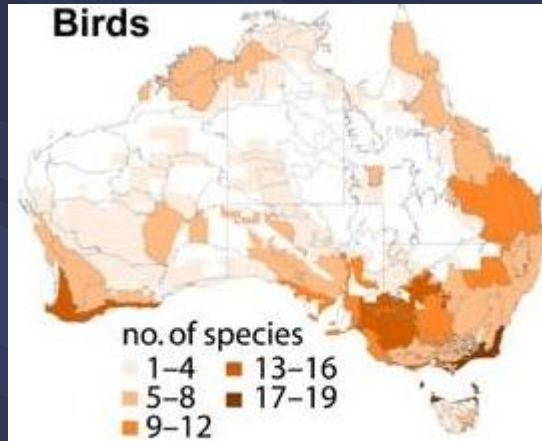
Water Quality – phosphate, nitrate loads in streams are increasing

Nitrates

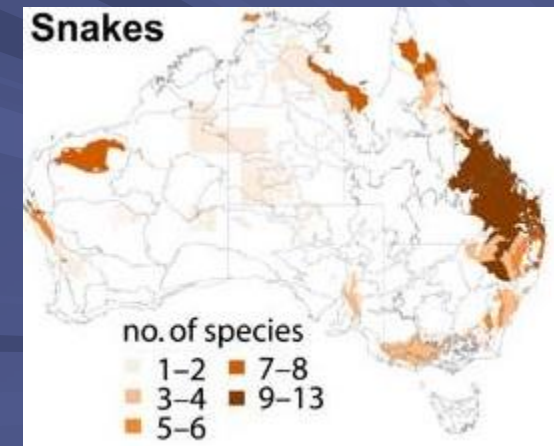
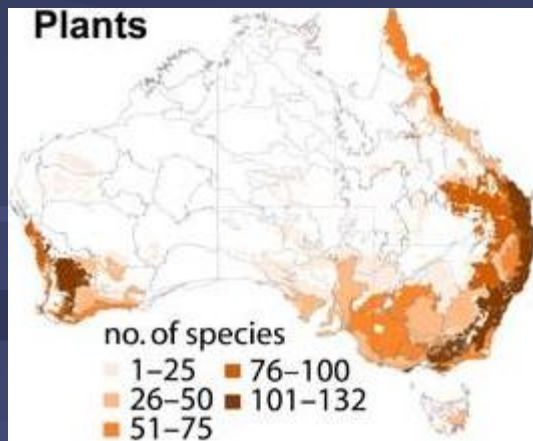
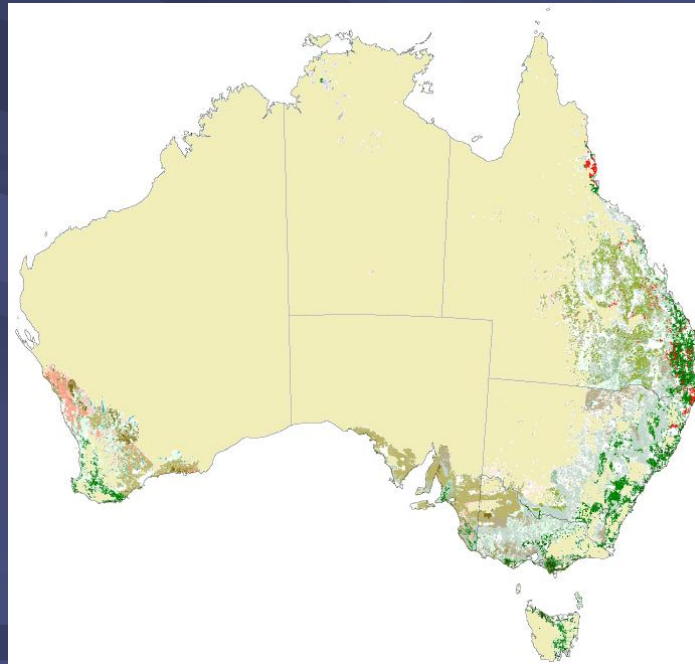


Phosphates

Biodiversity – Rare & Threatened Species



Vegetation lost to land clearing



Natural Resources are Under Stress – and it is possible that Genuine Savings in Australia is systematically lower than ANS

But what does that imply for sustainability?

Other economic indicators (other than GS, ANS)

- There is a long tradition of tracking **resources prices** (better yet, **rents**) as scarcity indicators
 - No discernable trend of increasing resource commodity prices
 - Water market-prices are of potential interest, but variability masks trends
- It seems that **factor intensity** of air (as a sink for waste) is decreasing . Despite more efficient use of environmental capital, there is evidence of increasing scarcity (Thampapillai). It all adds up to scarcity increasing at a slower rate.
- Imagine we knew that factor intensity was decreasing, too, for land clearing, irrigation water, nutrients in surface water, etc.

This might provide a clue that a weak sustainability track for Australia is attainable, provided we attend to particular resources under stress

Particular resources under stress – Getting the Prices Right

- Regulatory instruments
- Pigovian prices
- Markets in
 - Water
 - Water markets expanding – attempts to rationalize entitlements and markets in fragmented systems
 - Permanent sales have been miniscule, flow rents up to 10% of annual allotments – Connected Murray River system
 - 13% of river basins have environmental flow plans – many others have temporary flow requirements
 - Pollution reduction credits
 - South Creek bubble
 - Hunter River salinity

Getting the Prices Right (cont.)

Markets in –

- Habitat conservation
 - Bush Tender pilot projects – contracts auctioned, no after-market
- Dryland salinity
 - Several pilot projects
- Murray-Darling Basin salinity
 - Trading credits among states – no trades recorded
- Carbon
 - Initiated in NSW 2005

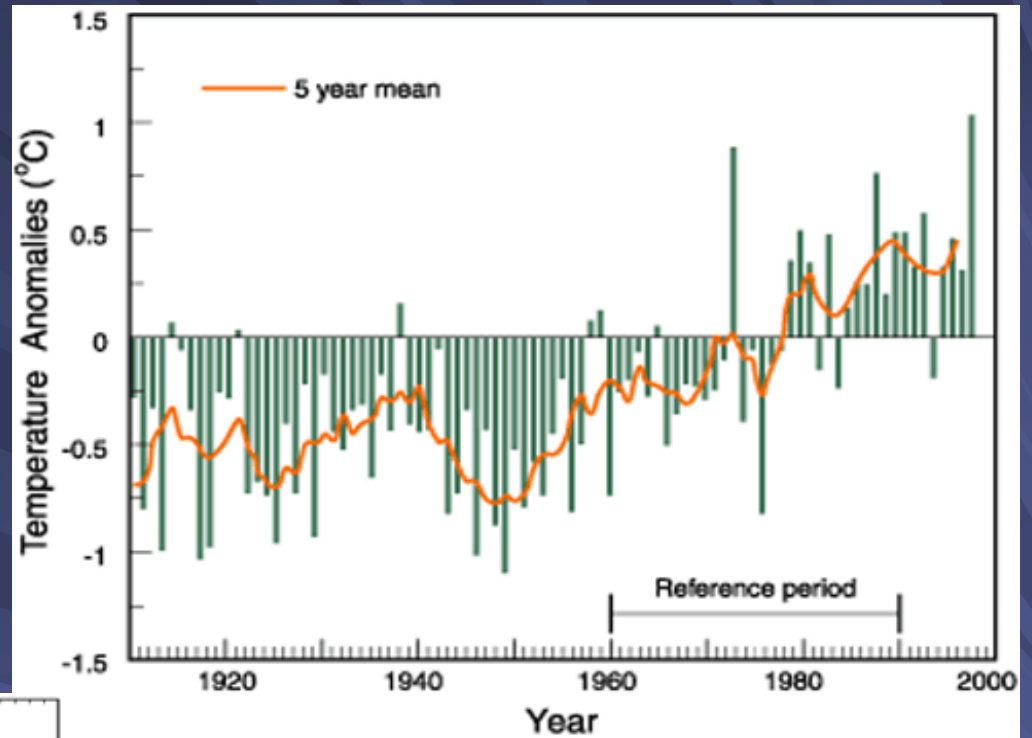
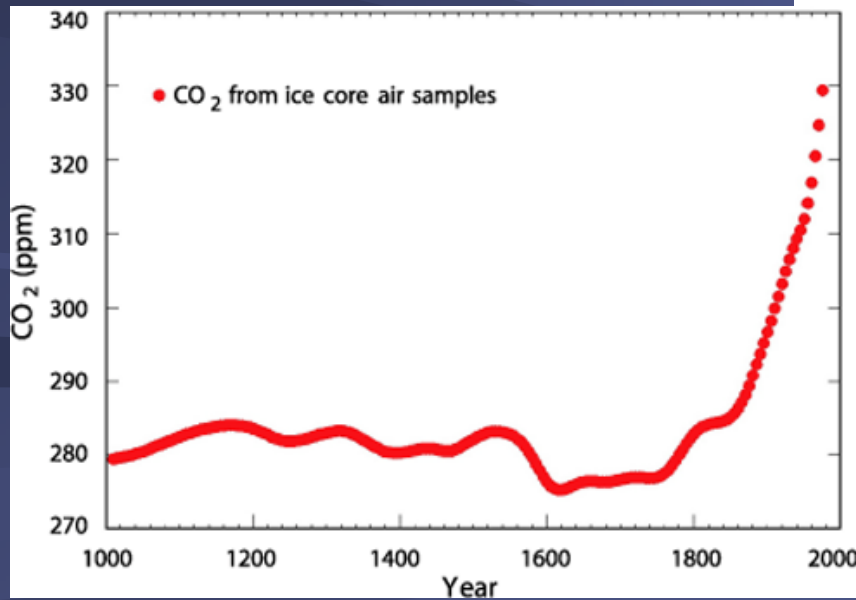
Is weak sustainability enough?

- Perhaps it is, for **water** and **pollution**, although particular cases may require more
- Even weak sustainability asks us to do much more than we are doing now
- **Habitat conservation** and **biodiversity** likely require attention to specific resources in particular cases

The political impediments to systematic weak sustainability are so substantial that solutions in the real world may involve some deviations from WS, shored-up with (very) piecemeal strong sustainability instruments

Climate

■ CO₂ increasing



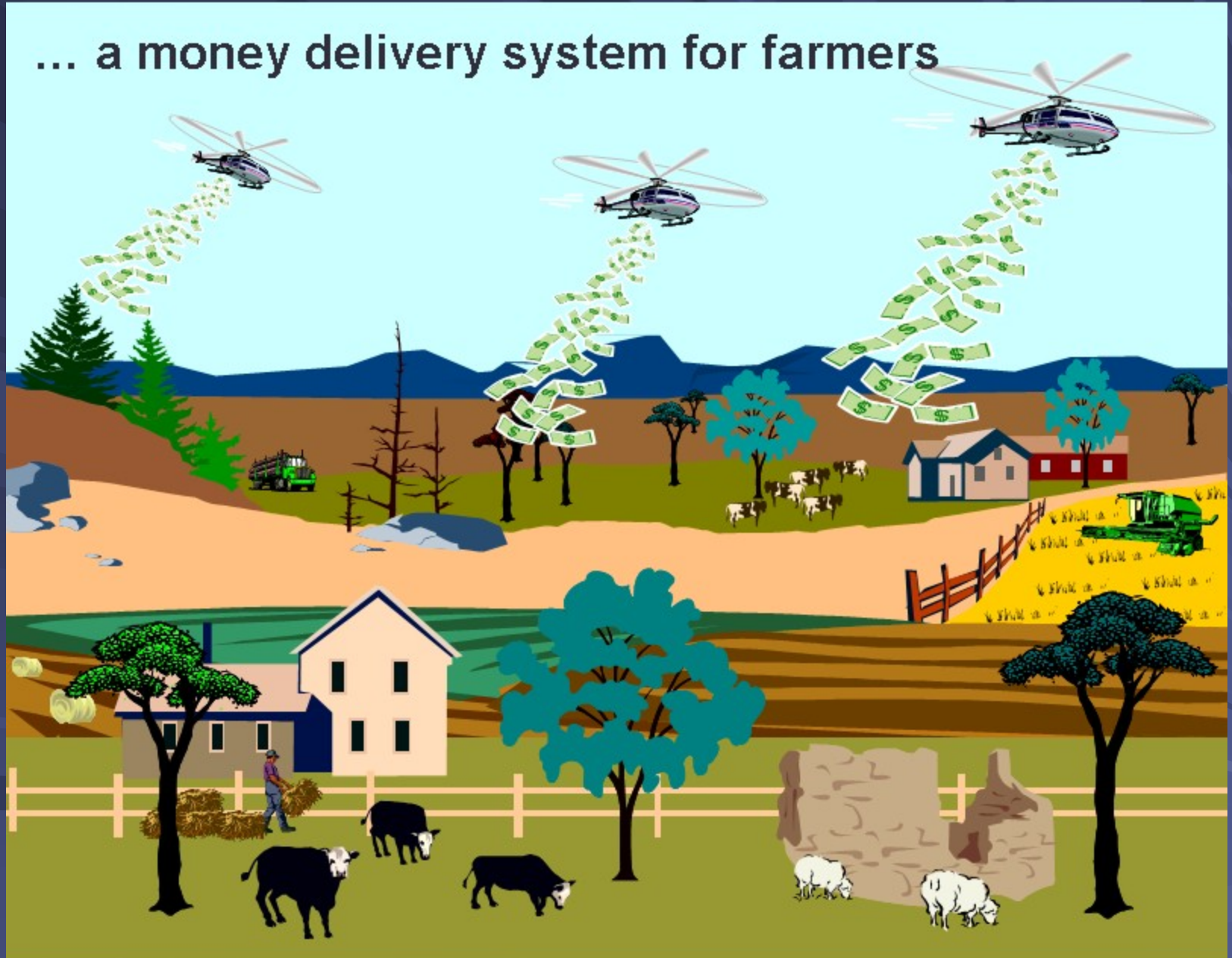
■ Temperatures rising

Getting the prices right for climate

- Insurance
- Catastrophic risk insurance and reinsurance
- Carbon/GHG taxes
- Tradable carbon permits
 - Opportunities for farmers to produce CRCs
 - But monitoring and enforcement matter. The goal is a GHG reduction delivery system for global society, not just ...

Not just ...

... a money delivery system for farmers

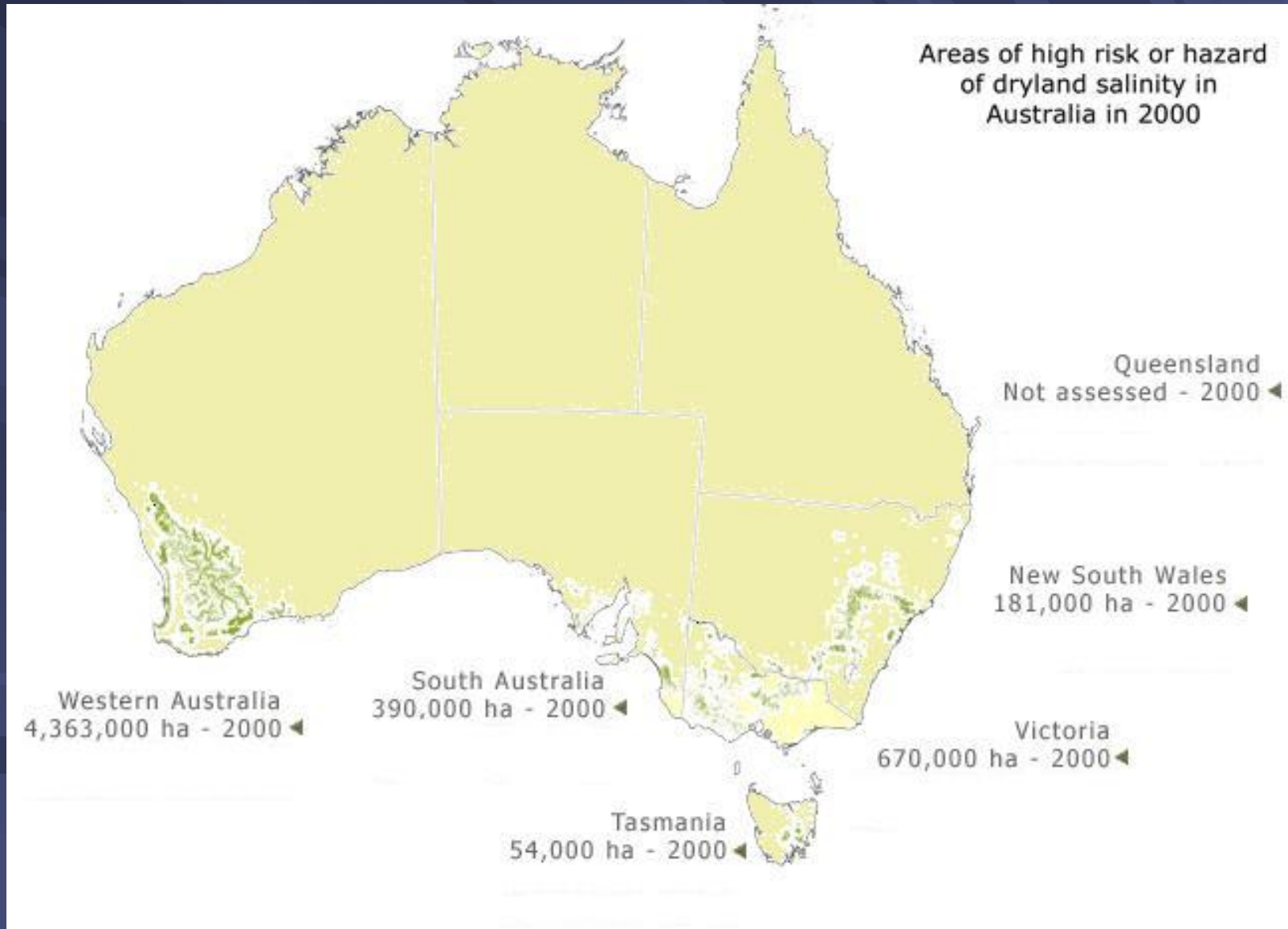


Are Weak Sustainability Solutions Enough for Climate?

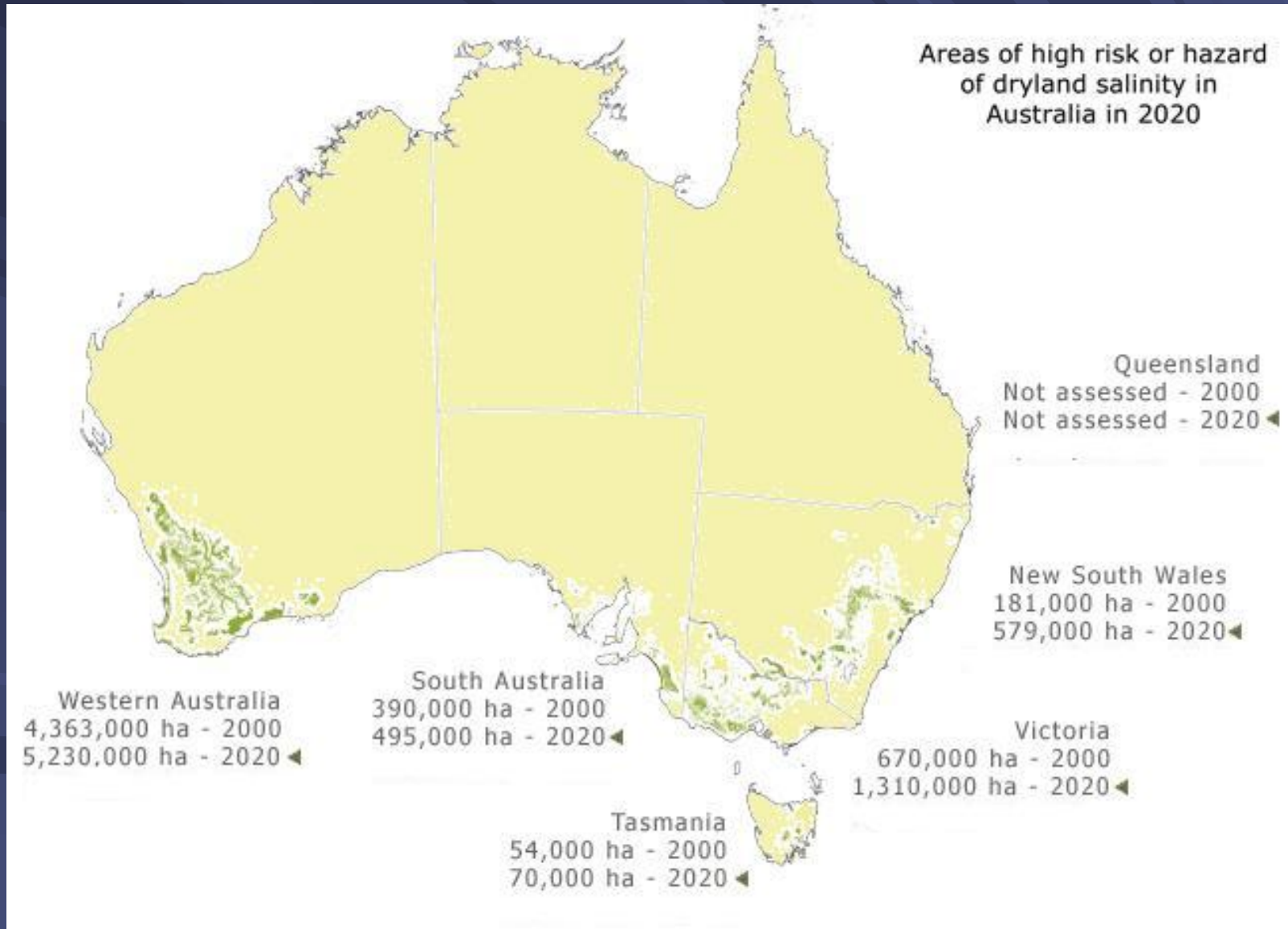
- First, we are a very long way from implementing systematic weak sustainability solutions for climate
- Weak sustainability solutions for climate involve systematic provision of global public goods ... no easy task for economics, politics, and diplomacy

If strong sustainability solutions are needed, we may not have the global social-political capital to get it done

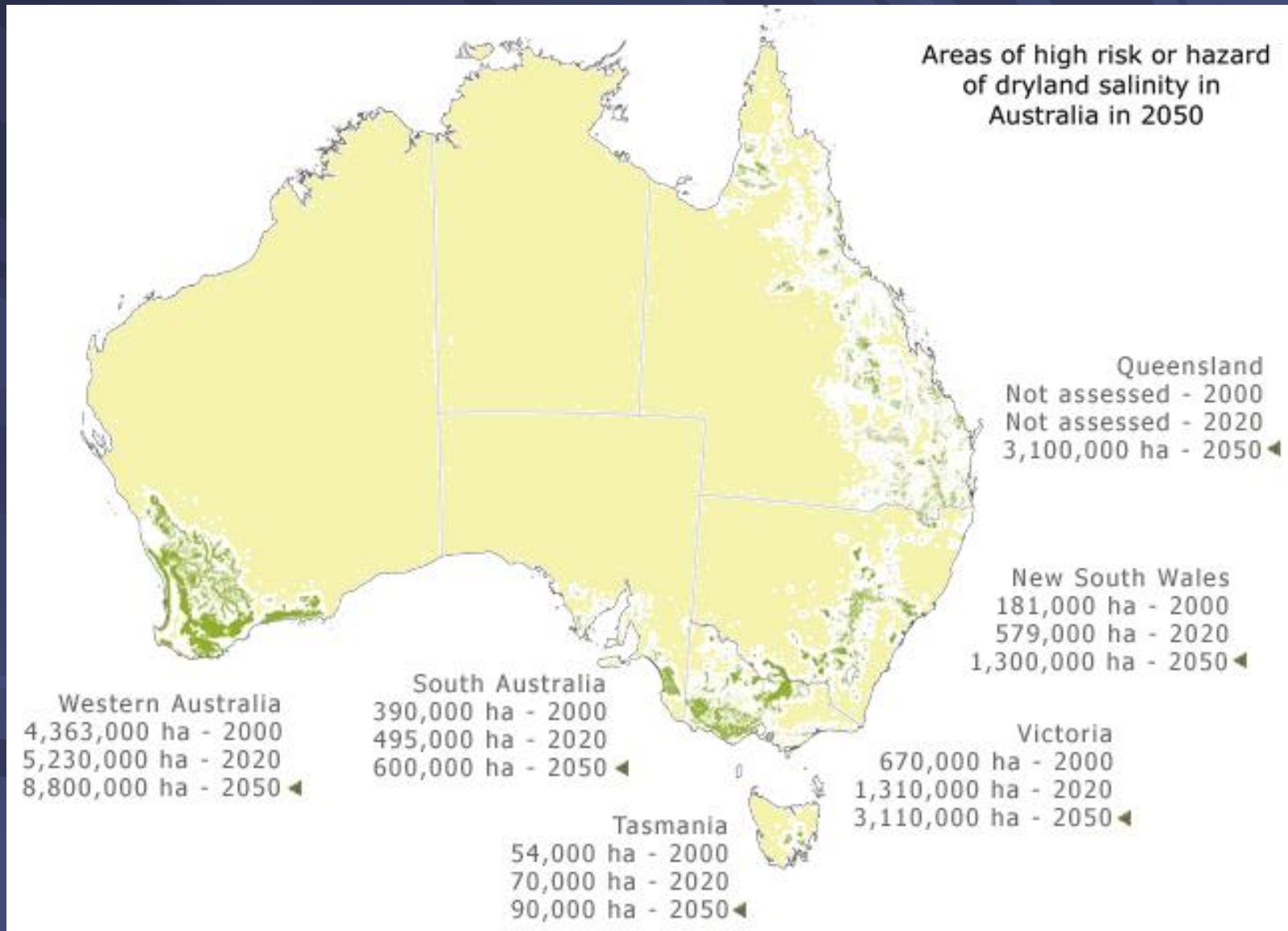
Dryland Salinity, 2000



Dryland Salinity, 2020



Dryland Salinity, 2050



Getting the prices right for dryland salinity

Suppose we know factor intensity of salinity is decreasing

- Much less comfort in this case – because damage is irreversible, it would just mean that we are “mining the soil” a little more slowly

What are the market failures?

- Common pool problem? Evidence suggests the common pool aspect of this problem is of modest dimensions
- Myopia? But let's face it ... strong prevention and mitigation measures are unprofitable at any realistic discount rate

Perhaps this is a **genuine strong sustainability problem**

A Sustainability Puzzle

Imagine an opportunity that would make us enormously rich but would lead eventually and with certainty to environmental crisis. We are infinitely long-lived, so we would both enjoy the riches and bear the disaster

Should we accept this opportunity?

Should we accept this opportunity?

1. Of course we should! We'll be enormously rich when the disaster comes, so we can bribe the disaster to go away ... pay to prevent it ... pay to fix up after it
2. No, we should not accept it! Perhaps all our riches will be to no avail; the disaster just won't respond

[This is exactly what we mean when we worry about possible *exhaustion* of an *essential* resource]

Strong Sustainability and the Precautionary Principle

Strong sustainability has been variously defined as

- **A Strict Policy Prescription**
 - Sustain renewable resources in kind ... “cut a tree, plant a tree”
 - **And** compensate for exhaustible resource extraction with commensurate investments in renewable resources
- **Any concern for particular natural resources** over and above what would be motivated by ordinary welfare concerns

The Precautionary Principle – there are dozens of definitions. Here is mine

- **In deference to fears of asymmetric risk, we should take avoidance and mitigation measures beyond those justified by expected welfare considerations.**

Precautionary Instruments

A Safe Minimum Standard of conservation ...

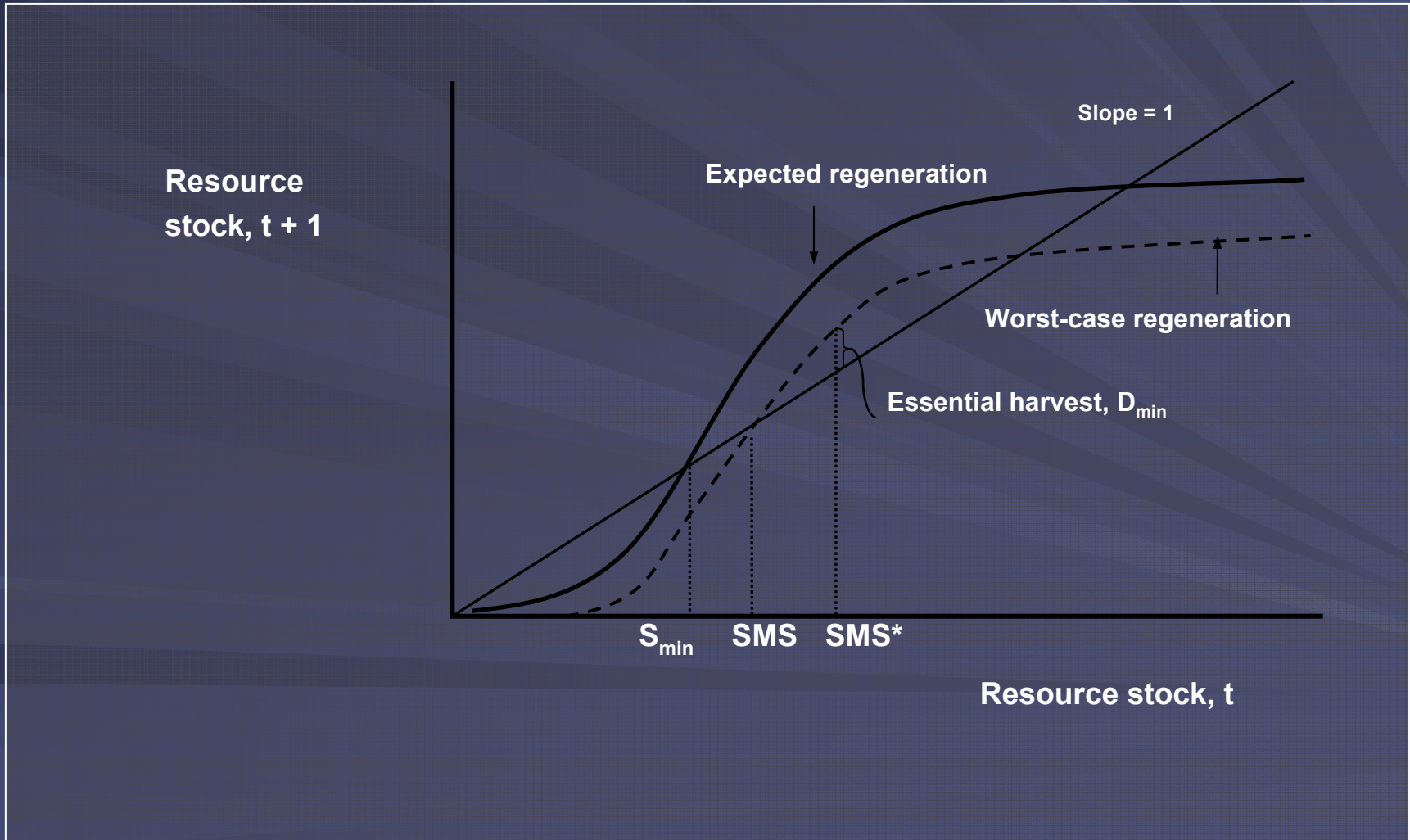
- Focus on particular, threatened resources
- A constraint upon business as usual invoked for good reasons

Conserve enough of the resource to assure its survival (allowing for uncertain regeneration and essential harvest), unless the costs of so doing are intolerably large

Setting the SMS

Providing for essential use

- Facilitates intergenerational commitment
- Determines the intolerable cost



What is the Political Scope for Precautionary Instruments such as SMS?

It is easiest to think of them in the endangered species context (where they have been used in the US for more than 30 years)

- Effective for problems of modest scope, where the sacrifice is modest and/or compensation is affordable
- Where do the biggest challenges arise?
 - Near the Southern California coast, where there are many rare species and demand for land conversion tends to overwhelm all else
 - In the Pacific Northwest, where serious implementation in the wild salmon case would bring serious economic disruption to several states

This suggests tough going for serious precautionary policies for dryland salinity, where

- Massive areas of crop and pasture land are at risk
- Which implies serious SS policy could be seriously disruptive

Scope for **Precautionary Policies** at the Local Level?

CHG and Climate

- In the US, state and local policies and programs are emerging
 - There is little evidence of their effectiveness in changing global prospects ... although, while they remain voluntary or consensual, it is hard to imagine them doing harm
 - They may well be effective in mobilizing people, setting examples, and transforming attitudes – things economists have tended to dismiss too readily

Dryland Salinity

- Efforts are modest, and voluntary programs seem to be the norm
 - Landcare
 - Organized tree planting efforts

Justifications for Sustainability Policies

Weak sustainability

- Utilitarian to the core (but that doesn't make it non-controversial)

Strong sustainability

- Utilitarian justifications are difficult
- Many competing non-utilitarian justifications ... most argue from asserted principles of various kinds

A sensible middle ground – weak sustainability for business as usual, with strong sustainability exceptions for special cases

Strong sustainability exceptions justified by principles that would be honored by many different moral systems

- Don't sell-out something unique and valuable for modest gain
- Don't take inordinate risks for modest gain
- Don't impose big risks on the public for modest private gain
- Don't impose big risks on the future for modest immediate gain

Understanding the Precautionary Principle as a Principle*

Public debate about principles ... or about trade-offs, benefits and costs?

Policy tends to be pragmatic.

- Pragmatism – No value matters until it matters
 - Good for day to day social decisions
 - Disaster for incomplete values about the distant future

How can policy accommodate principles?

- Technologies for meeting objectives (e.g., BCA) are not good tools for **defining** objectives
- Cannot get moral consensus with processes designed to submerge moral issues and discourse

Precautionary principles – rules, or principles that guide?

* My intellectual debt to Michael Farmer is evident throughout this presentation, but especially in the next 3 slides

Understanding the Precautionary Principle as a Principle

What do we mean by principles?

- Principles are moral intuitions that are prior to moral systems – many moral systems may recognize a particular principle
- A principle is not a complete moral system, but must anticipate and account for competing and conflicting principles
- To call a moral statement a principle does not grant it lexical priority over other principles
- Yet, a principle is much more than a preference – we feel a serious moral loss when we have to compromise a principle in a particular case
- Agreed principles provide a frame for policy resolution

What can we reasonably ask government to do, in an era when government seems afraid of governing?

Do more to get the prices right

- Pigovian taxes
- Facilitate markets
- Regulatory approaches

Articulate clear principles and take them seriously in practice

- Commitment to strong sustainability exceptions in cases that exceed a threshold of concern
- Commitment to transparent and inclusive public decision processes
- Commitment to equitable sharing of burdens – esp. burdens undertaken to benefit future generations

Bind managers to principles, but encourage them to interpret principles in practice via a serious policy dialogue

- *Neither* planning to the 4th decimal place, *nor* abdication to stakeholder conventions