Estimating depletion and degradation

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Overview

- What is:
  - Depletion
  - Degradation

- SEEA guidance on how to estimate
  - Depletion
  - Degradation

Depletion defined I

- *What is depletion?*

Monetary:

- *'… the reduction in the value of deposits of subsoil assets as a result of the physical removal and using up of assets.'*

Source: SNA, 2008

Depletion defined II

Physical:

- *'…decrease in the quantity of the stock of the natural resource… due to the extraction by economic units occurring at a level greater than regeneration.'*

Source: SEEA, 2012




Why measure depletion? I

Under the SNA,

"... a country could exhaust its mineral resources, cut down its forests, erode its soil, pollute its aquifers, and hunt its wildlife to extinction, but measured income would not be affected as these assets disappeared"

(Repetto et al, 1989)

Why measure depletion? II

- The SNA treats the gradual using up of produced capital - buildings, structures, machines and other equipment - as a cost of production

- However, using up (depletion) of natural capital (e.g. mineral resources, forests, fish stocks), is not regarded as a cost of production

- Incomes generated from exploiting natural capital may appear high in the short term, but may not be sustainable in the long run

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Depletion of natural biological resources

WAVES

- Where extraction is less than the sustainable yield, no depletion is recorded

Figure 5.4.1, source: SEEA Central Framework 2012

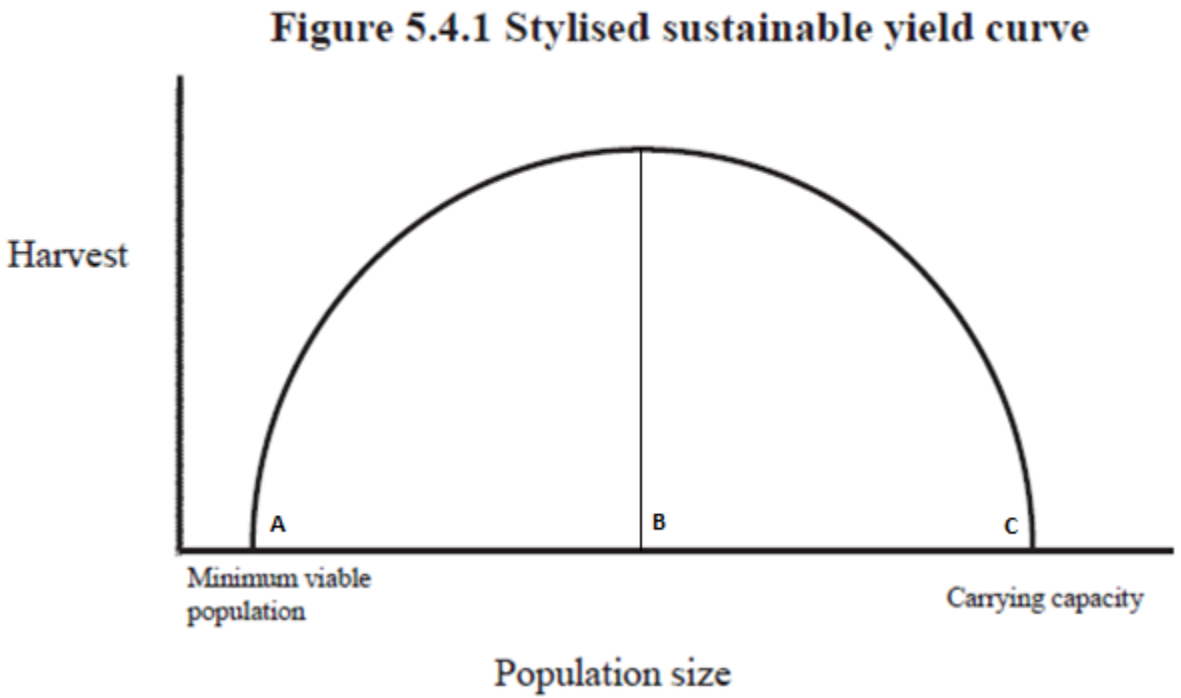

Figure 5.4.1, source: SEEA Central Framework 2012

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Depletion of a renewable resource

- Forests, fish stocks etc.
- Need to take into account the natural rate of replenishments when measuring depletion for renewable resources.
  - i.e. (Stock t) – (Stock t+1) + (Natural Growth) = Extraction
  - When total < 0 no extraction recorded

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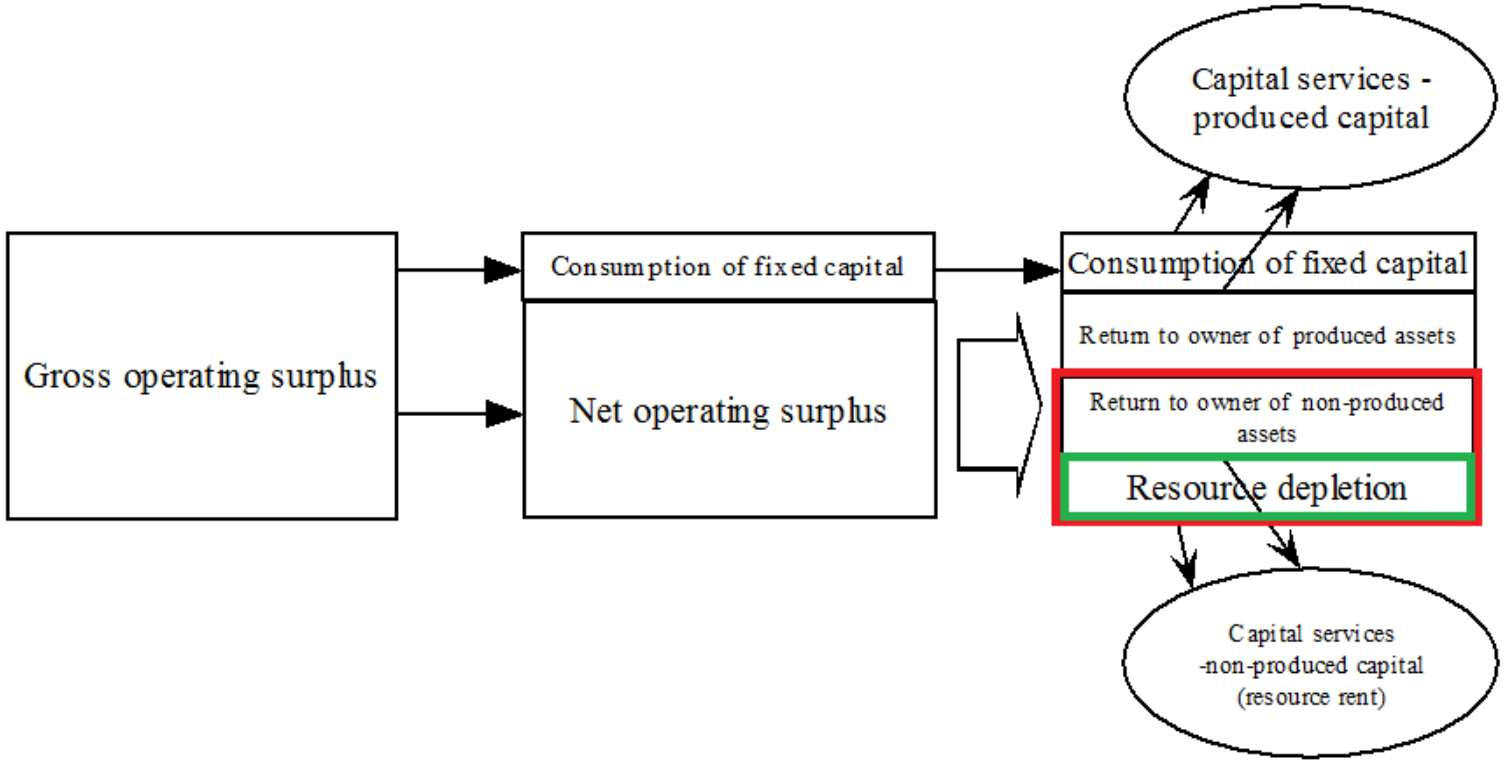
Identifying depletion

WAVES

- **Depletion** is a component of resource rent



Depletion: elements of the calculation

Gross Operating Surplus

- Consumption of Fixed Capital (COFC)
- Return to owner of produced assets
- Return to owner of natural capital

= Depletion

Environmentally-adjusted NDP

- Refer to the exercise in the *Measurement and valuation of environmental assets* session

Year 1	$ million
For the whole economy	
Gross Domestic Product (GDP)	$117 million
Consumption of fixed capital	$19 million
Net Domestic Product (NDP)	$98 million
Less depletion of mineral resources	
Net Domestic Product - environmentally-adjusted (NDPea)	

Other adjusted economic aggregates

- Adjustments can also be applied to other key economic aggregates
- The link between GVA and GDP can be defined as:
  - GVA (at current basic prices; available by industry only)
  - plus taxes on products (available at whole economy level only)
  - less subsidies on products (available at whole economy level only)
  - equals GDP (at current market prices; available at whole economy level only)
- **GVA + taxes on products - subsidies on products = GDP**

Environmentally-adjusted industry value added

- Adjustments can be made to industry level economic indicators
- Helps identify environmental impact of a given industry

Year 1	$ million
For the mining industry	
Industry Gross Value Added (mining)	$28 million
Consumption of fixed capital (mining)	$4 million
Industry Net Value Added (mining)	$24 million
Less depletion of mineral resources	
Net Domestic Product - environmentally-adjusted (NDPea)	

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Degradation defined

- '…considers changes in the capacity of environmental assets to deliver a broad range of ecosystem services and the extent to which this capacity may be reduced through the actions of economic units, including households.'

  Source: SEEA, 2012

- Gretton and Salma (1996) in the context of land & soil… 'decline in the biological productivity or usefulness of land resources for their current predominant intended use caused through the use of the land by humans. '

Land degradation I

- Where land is used sustainably it has an infinite life and no adjustment for degradation is required
- As such, the whole value of the resource rent should rightly be considered as income.

Land degradation II

- However, where land is being degraded due to economic activity, an adjustment to income is applicable.
- Land degradation reduces the land's ability to produce environmental services.
- Can you provide examples of how land can be degraded?

Estimating Land Degradation, Australia

- The ABS most commonly draws on the methodology used in a Australian study by *Kemp & Connell, 2001,* when attempting to measure economic losses due to LD.

Kemp, 2001, ABARE - Impact of land degradation on Australian Agriculture.pdf

Estimating land degradation - experimental estimates for Australia I

- Kemp and Connell (2001) combined data from a farm survey with land value data to estimate the difference in the capital value of farms with and without degradation at $14.2 billion in 1999
- The ABS has assumed that degradation accrued at a constant rate over the past 50 years; ($14.2 billion / 50 = $284 million pa),

  - and will continue at this rate into the future, i.e. $284 million degradation per year (in 1999 dollar terms)

Estimating land degradation - experimental estimates for Australia II

- A second study, the National Land and Water Resources Audit (2002), used models to estimate the lost profit at full equity (PFE) due to soil degradation at $2.6 billion in 1996–97

- The return to the owner for the use of the produced capital (63%) is removed from the PFE using ratios from the Australian SNA.

- Therefore the lost resource rent is 37% of PFE, or $947 million. The NPV of the resource rents foregone is calculated using the real long term government bond rate (5.8%) and equals $16.4 billion. This represents the value of land lost due to land degradation

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Estimating land degradation - experimental estimates for Australia III

- In order to estimate the year to year change in land value due to degradation, the ABS has again assumed that degradation accrued at a constant rate over the past 50 years

  i.e. $16.4 billion / 50 = $329 million per year (in 1997 dollar terms)

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Any Questions?