

an ecologically minded  
economist would say  
natural capital instead of  
natural resource

**Natural** + **Capital** = **Natural Capital**

provided by the environment      a form of wealth to make more wealth      environmental wealth to make wealth

1. Renewable Natural Capital = living & non-living  
(Replenishable)
2. Non-renewable natural capital = fossil fuels  
(geological time scale too long to be renewable)

# Natural Capital:

- Capital: a form of wealth to make more wealth
- Natural: provided by the environment (natural)
- Two types of natural capital:
  - Renewable: living & non-living
    - Replenishable (non-living)
  - Non-renewable : geological time scale too long
    - ex: fossil fuels (coal, oil, natural gas...)
- Can be exploited to produce natural income

# Natural Income:

- Income: services & goods (products) – the gain or ‘interest’
- Natural: derived from the environment
- services and goods (products) derived from natural capital
  - ex: fire wood is the ‘gain’ derived from trees

- Going over the multi-choice quiz – wrap up justification of last few questions...

# Key words:

- Sustainability
- Sustainable development
- Sustainable yield

3.2.5	Explain the concept of sustainability in terms of natural capital and natural income.	3	The term “sustainability” has been given a precise meaning in this syllabus. Students should understand that any society that supports itself in part by depleting essential forms of natural capital is unsustainable. If human well-being is dependent on the goods and services provided by certain forms of natural capital, then long-term harvest (or pollution) rates should not exceed rates of capital renewal. Sustainability means living, within the means of nature, on the “interest” or sustainable income generated by natural capital.
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# sustainability

VS.

# sustainable development

- the use of global natural capital at a rate that allows natural regeneration and minimizes damage to the environment

e.g. harvesting renewable resources at a rate that will be replaced by natural growth

- focuses on the **rate** of natural capital use
- sustainability suggests maintaining a **balance/equilibrium**

• <http://www.youtube.com/watch?v=B5NiTN0chj0>

- ‘development’ that meets current needs without compromising the ability of future generations to meet their own needs

(no single definition exists!)

- is more about a general **approach** to development
- suggests progress, improvement, **change for the better**

• [http://www.youtube.com/watch?v=Gahs\\_Ew0oMU&feature=related](http://www.youtube.com/watch?v=Gahs_Ew0oMU&feature=related)

3.2.6	Discuss the concept of sustainable development.	3	<p>The term “sustainable development” was first used in 1987 in <i>Our Common Future</i> (The Brundtland Report) and was defined as “development that meets current needs without compromising the ability of future generations to meet their own needs.” The value of this approach is a matter of considerable debate and there is now no single definition for sustainable development. For example, some economists may view sustainable development as a stable annual return on investment regardless of the environmental impact, whereas some environmentalists may view it as a stable return without environmental degradation.</p> <p>Consider the development of changing attitudes to sustainability and economic growth, since the Rio Earth Summit (1992) leading to Agenda 21.</p> <p><b>Int:</b> International summits on sustainable development have highlighted the issues involved in economic development across the globe, yet the viewpoints of environmentalists and economists may be very different.</p>
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3.2.7	Calculate and explain sustainable yield from given data.	3	Sustainable yield (SY) may be calculated as the rate of increase in natural capital, that is, that which can be exploited without depleting the original stock or its potential for replenishment. For example, the annual sustainable yield for a given crop may be estimated simply as the annual gain in biomass or energy through growth and recruitment. See figures 1 and 2.
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**Figure 1**

$$SY = \left[ \frac{\text{total biomass}}{\text{energy}} \text{ at time } t + 1 \right] - \left[ \frac{\text{total biomass}}{\text{energy}} \text{ at time } t \right]$$

**Figure 2**

$$SY = (\text{annual growth and recruitment}) - (\text{annual death and emigration})$$

Thirteen of the planet's major fishing areas are now fished at or beyond their capacity.

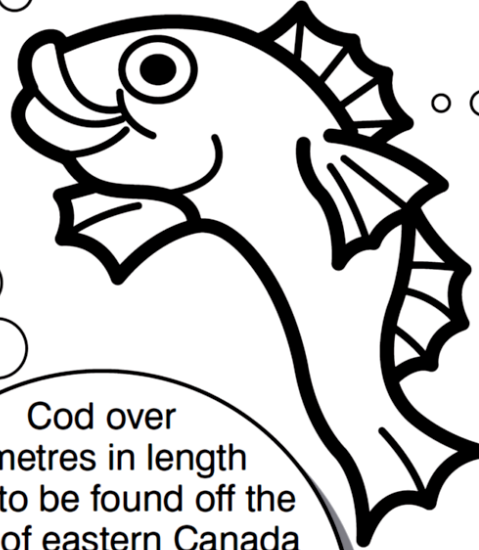
There is an alarming decline in fish stocks caused by over-fishing coupled with an increasing demand for fish due to health issues and a rise in world population.

More than 60% of stocks need urgent intervention to control or reduce fishing, says the UN FAO organisation.

Swordfish caught in the past used to weigh about 100 kg. Now they are only 30 kg in weight.

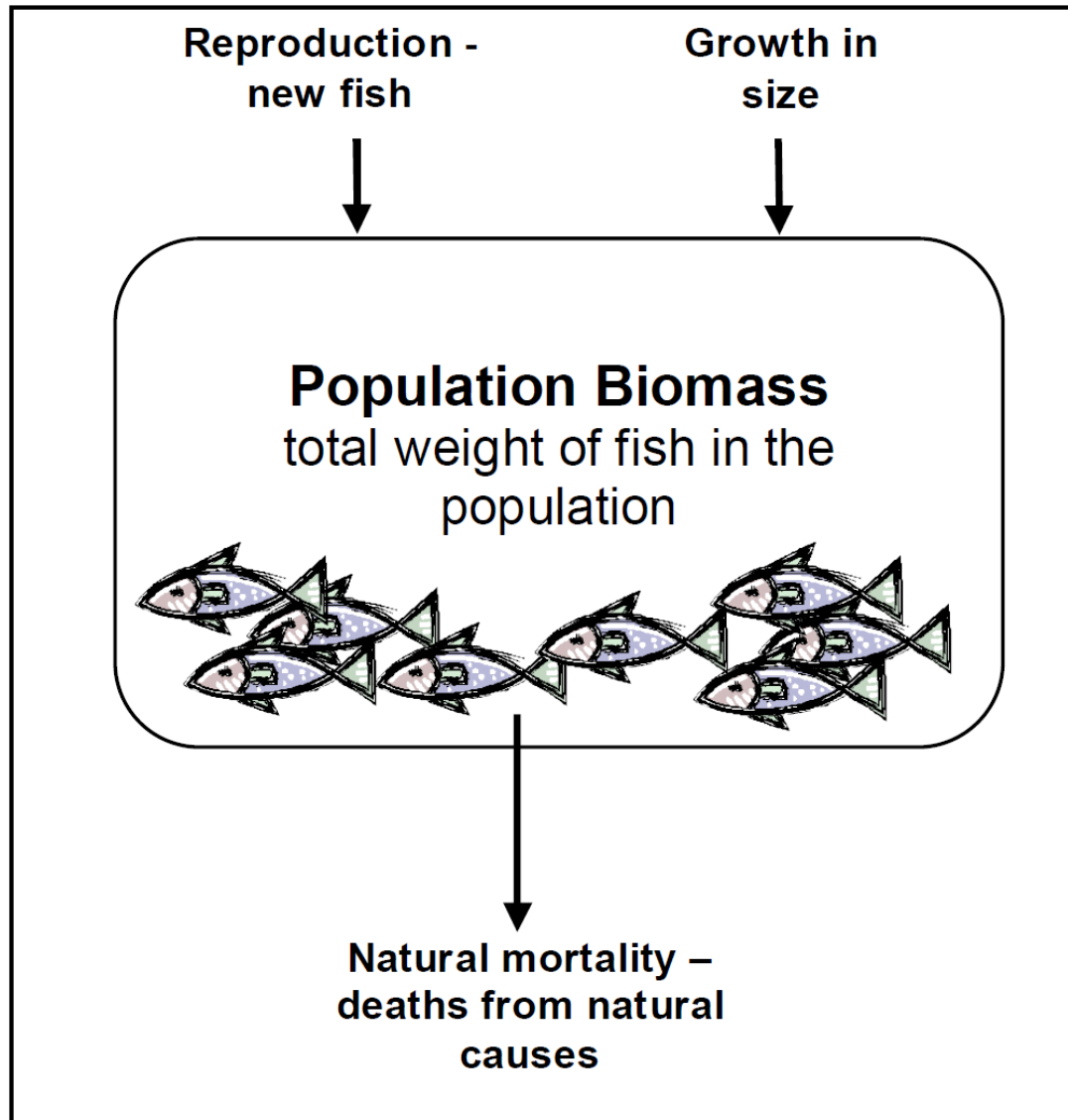
Cod over 2 metres in length used to be found off the coast of eastern Canada but have now almost vanished and may never come back as the ecosystem has changed so much. Tens of thousands of people are out of work.

It is impossible to meet today's demands and still leave a legacy for the future. It just can't be done.



**Fishy facts**

# Fisheries as an example



# The following factors vary substantially between different fish species:

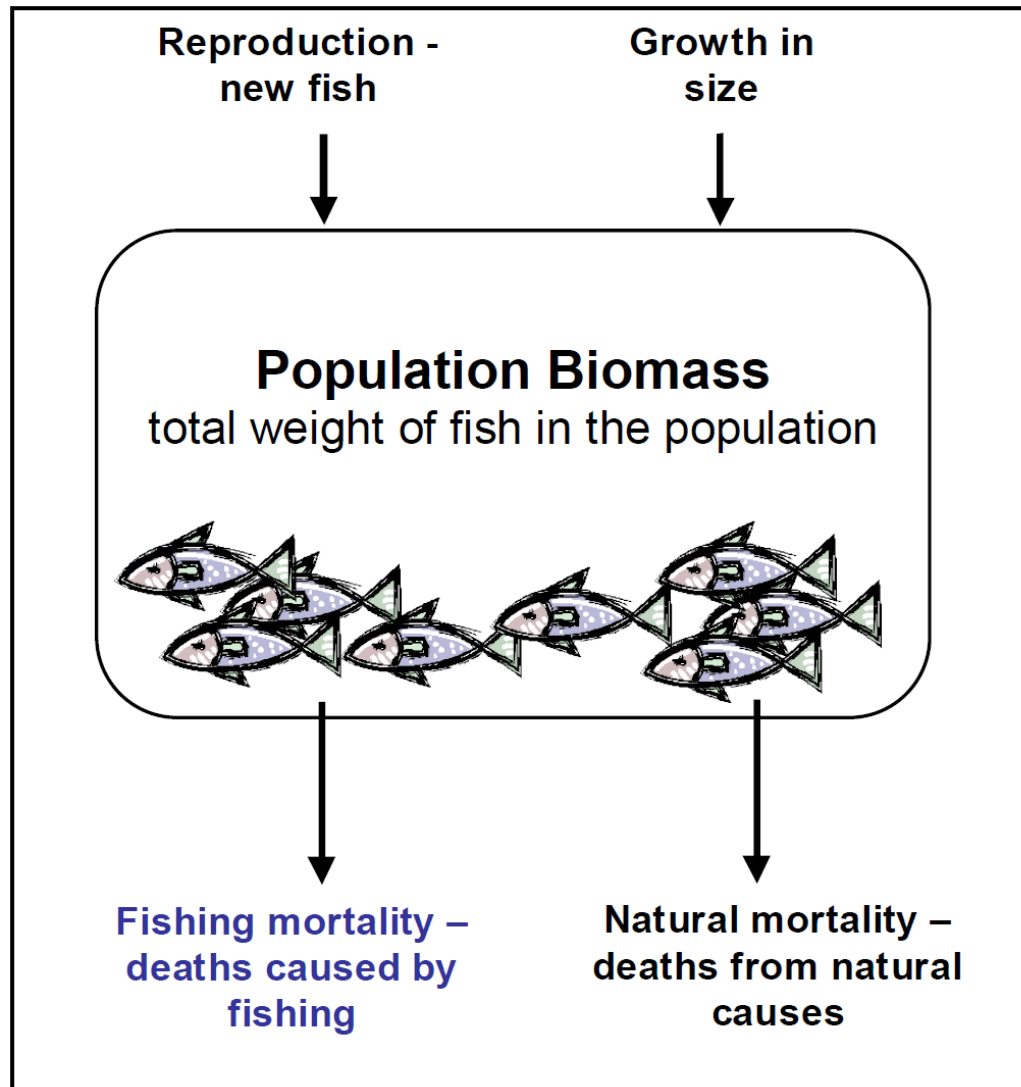
- **growth** of the fish over time can be rapid (e.g. flounder), or slow (e.g. orange roughy).
- Large numbers of new fish can be **reproduced** at a time (many fish species), or only a few (e.g. sharks).
- some species have higher rates of natural **mortality** than others (e.g. scallops have high levels of natural mortality).

**SO...**

unfished populations may be quite stable over time,

**OR** they might vary a lot.

In a **fished** population, there is another factor that affects overall population biomass: the level of fishing mortality (i.e. how many fish are caught).



A sustainable catch (or 'yield') is one where:

$$\begin{array}{c} \text{Reproduction + growth} \\ > \\ \text{natural mortality and fishing mortality} \end{array}$$

# The Tragedy of the Commons

- The Tragedy of the Commons argument is that shared resources tend inevitably to be overused and ruined. But that isn't what really happened with the historical commons in England. This video explains the Tragedy argument and some of its flaws.

<http://www.youtube.com/watch?v=lwaNZgY9PCQ&feature=related>