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## Defining and Measuring Sustainability

- ① Definitions of Sustainability
- ② Economic Factors
- ③ Triple Bottom Line
- ④ Environmental Factors
- ⑤ Societal Factors
- ⑥ Examples of Sustainable and Unsustainable Development

① Energy measures are 200+ years old, fuel-specific and often country-specific as well. There are multiple units used, but they can be converted into each other.

In contrast, sustainability is never, often viewed in a global or at least regional context, across fuels... and is quite difficult to quantify. This inability to accurately measure sustainability stems from our vagueness in defining it.

BEGIN THIS CLASS BY WRITING OUT YOUR OWN, ONE-SENTENCE DEFINITION OF SUSTAINABILITY.

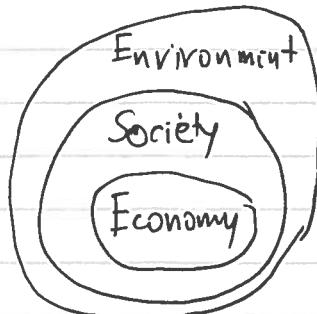
One of the most commonly cited definitions of sustainability is given in the UN's Brundtland Report (Our Common Future, 1987): "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

PROBLEMS What are our needs? What will future generation's needs be?

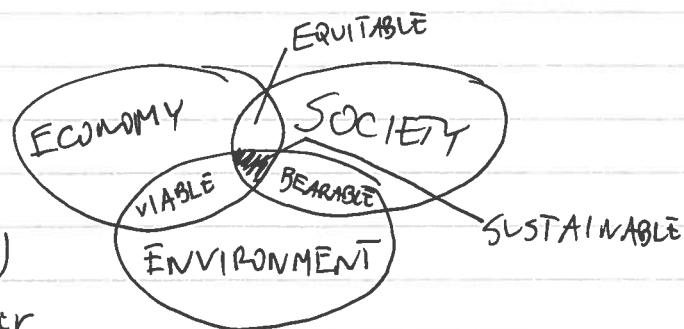
- These things are changing and are difficult to predict - e.g. proportion of 20-year olds driving cars is dropping, as car-share programs become more common-place.
- Future generations - how many? One, two, thirty? How long will humans exist on Earth, does any of this matter?

Who plays a role in defining sustainability?

Businesses, environmental community (fragmented), governments (EPA, congress)  
Consumers and citizens.

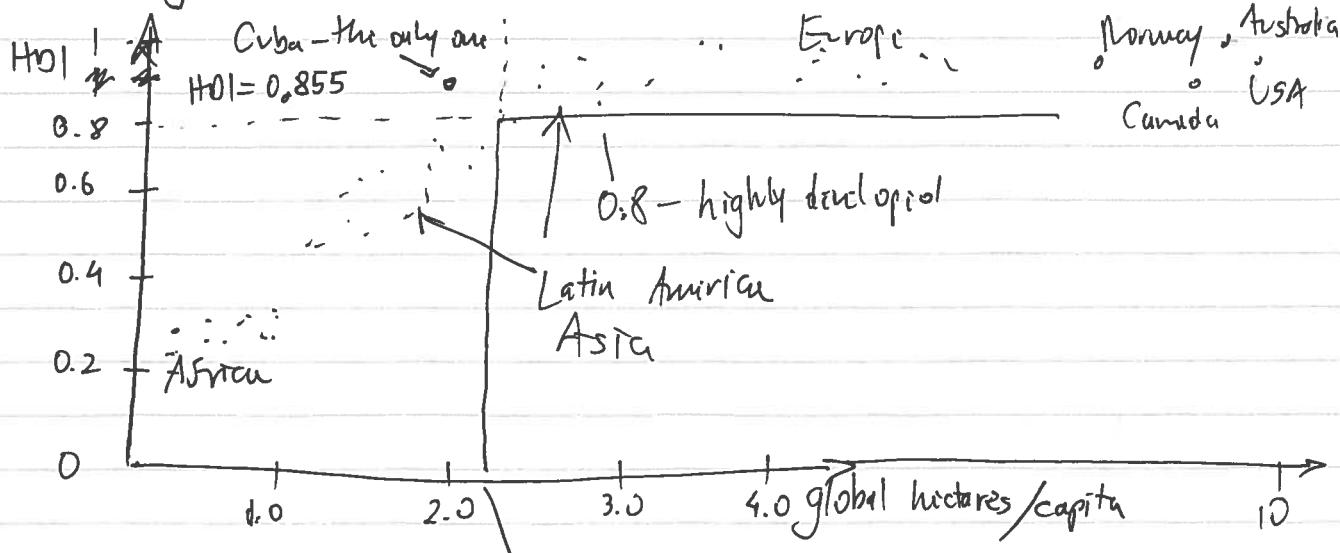


Some include culture as the fourth sphere, but this picture ignores the markets. Probably more realistic:



One of the more holistic measures is plotting Human Development Index (HDI)

against global hectares per capita (amount of land needed to produce all foods and energy and consumer goods a country uses):



What are the goals of our development? UN established these in its Millennium Summit in 2000:

- a) Eradicate extreme poverty and hunger
- b) Universal primary education
- c) Promote gender equality
- d) Reduce child mortality
- e) Improve maternal health
- f) Combat global diseases (HIV, malaria)
- g) Ensure environmental sustainability

## ② Economic dimensions

a) Is Nature an economic externality?

Cost of goods includes raw materials, production & distribution, plus profit. Traditionally, cost of damage to the environment was not included in this calculation. Should it be? This is a question that faces developed countries—which industrialized deeply but are not trying to include these environmental costs into the development of developing countries, chiefly China.

b) Can environmental degradation be decoupled from economic progress?

Some technologies—Internet, radio, phone—have increased quality of life at a relatively low cost to the environment. Do all new technologies have that potential? Maybe, maybe not. New technologies tend to be more energy-efficient than old ones, but the "unseen" energy is quickly reused again as a consequence of expansion. Still, some technologies change our preconceptions—e.g. driverless cars—and could yield big savings in environmental costs.

③ Triple Bottom Line (3BL) is a concept also known as Profits, People, Planet—title of one of Shell's environmental reports.

Shell is widely viewed as the most environmentally conscious oil company.

Profits / Safety / Environmental accounting

This is not just a rosy projection. While "evil companies" may indeed only care about the profits, their consumers and workers care about product and production safety, while governments care about environmental aspects, together with environmental groups. Thus, it is better for a company with potentially damaging environmental impact to get ahead of the issue and negotiate itself rather than be regulated.

An example of a company with a balanced TBL could be Goodwill Industries: essentially a recycling company (environmental), which employs people with disabilities (social) and sells stuff it received as donations. However, they pay low wages and try to cheat on giving their employees health benefits.

Another approach: instead of shareholders, involve all stakeholders in the making of relevant business decisions.

Global Alliance for Banking on Values - 25 banks, \$70b in assets, have applied TBL in their operations... but these are small banks. First Green Bank is the biggest one in the US.

Various certifications are also in place: Fairtrade, focus on coffee, tea, bananas and cotton - just 0.2% of UK grocery sales.

MN and OR are considering tax breaks for TBL corporations.

#### ④ Environmental Dimensions

Two approaches: environmental management and management of human demand on resources (consumption).

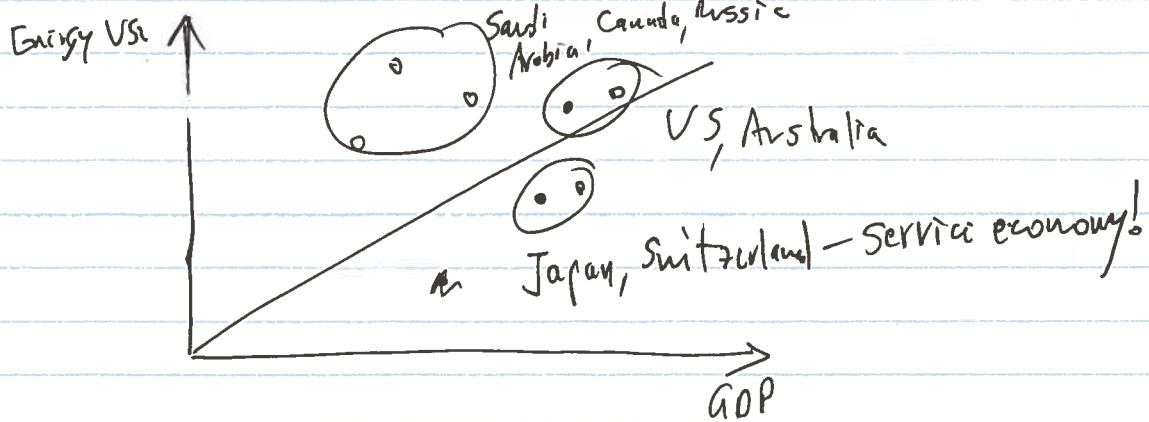
Atmosphere: managing and monitoring (and regulating) human emissions of pollutants ranging from CO<sub>2</sub> to aerosols, nitrogen oxides, sulfur oxide, soot, etc. One off these used to be ~~ozone~~ CFCs - which depleted stratospheric ozone - but this problem was largely solved through the Montreal protocol (1987). Contrast this with Kyoto protocol which was a failure. Why?

Oceans and freshwater resources: especially freshwater is limited and needs to be managed. Sea level rises? Changes in currents that prevail in certain regions. 600 million people ~~not~~ live in areas that could be endangered by sea levels rising.

Land use - loss of wetlands, deforestation, increased urbanization  
 all these ultimately relate to food production.

### Management of human consumption

- Consume less
- Make production, use, disposal more sustainable = REUSE / RECYCLE
- Concepts of energy and resource intensity  
 how many kJ / £ of GDP



UN Environment Program found that most environmentally unsustainable practices are:

- fossil fuel combustion
- fisheries (we will run out of fish by 2050)
- agriculture

On the consumption side:

- shelter (think of VS houses)
- mobility (airplanes, big cars)
- food
- energy-using appliances.

big culprits

Energy: CO<sub>2</sub> rise is unsustainable, big developed countries should cut their emissions by 60% to hold current levels.

Water Use: think California, drought  
shrinking aquifers

the case of Aral Lake - 4th biggest lake in the world in 1989, now almost completely disappeared because its two big rivers have been diverted

Case of big-scale geoengineering.

Good: harvest rainwater - Israel, Melbourne

Food: tasty, nutritious, produced and used locally, healthy

- Mediterranean and Japanese diets recommended by the UN

- both healthy and sustainable... but: no cherries in Dec!

- avoid food waste - bad for the environment

- unnecessary use of resources

- food thrown away in the UK will easily feed all Zambia

- US: competition b/w food and fuel: case of corn for bioethanol

Construction and raw materials

- from linear to circular flow of materials

- Science feature on recycling

- 95% of Al is recycled, but only 20% of Pb or Hg

- better product design

~0% for gold

## ⑤ Social Aspects

- war, corruption, crime - divert and distract from pressing issues

- Social mobility: if too low, then it impedes economic growth

- Using local cultural traditions is often very sustainable too, but

- poverty is a problem:

the poor, which often have higher ~~not~~ birth rates, exercise proportionally greater pressure on the environment

- examples: use of inefficient furnaces, no recycling, poor disposal

- construction industry in the US:

- too many empty houses, too much sprawl

- integrated developments are better:

- ecovillages

- or mixed-use residential development

- suburbs would be OK: if people actually grow their food