Environmental Ethics

Overview of the Subject

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Multiple Pedagogical Dimensions

- *Moral Theory:* what obligations do we have to other persons that involve environmental goods (e.g. future gen)? Do we have direct duties to any part of nature outside of human persons?
- *Value theory:* do different types of beings have intrinsic value? How do we defend or explain intrinsic value in sentient animals (as individuals or species), non-sentient life, ecosystems, landforms, biosphere as a whole? Are there hierarchies in kinds of natural value, including the value of morally capable beings?
- *Metaphysical problems* underlying these issues in value theory.
- *Social theory and politics:* theories of public goods based on collective action problems (where markets fail) are relevant to many environmental issues. This includes global coordination issues and questions about global political justice.
- *Science and Environmental Accounting*: the key facts about the main global environmental problems, including resource use projections and ecological footprint.

Approaches to Environmental Values

• *Anthropocentric* (related to human interests): ecosystem services provided by common environmental resources (air, oceans, wilderness); value of genetic information in wilderness species (for medicine, insurance against crop failures etc); and aesthetic values (contribution to human psychological health).

• *Animal rights:* tends to focus on the interests of sentient animals (e.g. the harms involved in large-scale factory farming); may defend 'rights' of individual animals or the collective interests of non-human animals (most often domesticated animals).

• *Biocentric*: defends the intrinsic value of life in all forms (often focuses on the value of species survival and biodiversity as collective biological values);

• *Ecocentric*: focuses on the intrinsic value of ecosystems that sustain life and a diversity of species forms, but also includes non-living landforms as having intrinsic value (either in themselves or for their contribution to life); also frequently includes reflection on the goods arising from human care for ecosystems and life-forms.

Ecosystem Services

- Pollination and insect pest control; provision of natural food sources;
- Regulation of climate balance and animal population stability;
- Absorption of carbon dioxide and release of oxygen;
- Maintenance and provision of genetic resources (for new crops, medicines);
- Maintenance and regeneration of habitat;
- Provision of shade, shelter, building materials and fuels;
- Prevention of soil erosion, maintenance of soil fertility and health;
- Maintenance of healthy watersheds, water filtration, water cycle, cloud seeding;
- Waste absorption and breakdown;
- Formation of soil and carbon deposits.

Sustainability and Duties to Future Generations

One area of particularly tough issues in moral theory:

- Do principles for intergenerational justice easily extend to environmental goods (Rawls)? Can we reject discounting of future costs and benefits in decision theory?
- Metaphysical puzzles about different people being born depending on which principles are adopted (Parfit); problems with utilitarian principles (e.g. Parfit's "repugnant conclusion").
- Examples: Locke on original acquisition and the proviso; Rousseau's conception of common ownership of the Earth; similar religious stewardship conceptions.
- Sustainability as central to an Endowment Model of Justice to the future:

-- analogy of a well-managed college endowment (only part of annual interest spent on annual operating funds; principal of the endowment expanded)

-- looking at ecosystem and biodiversity of the Earth as a kind of endowment that produces growth of new life and other byproduct yields each year (environmental accounting).

-- how much of the total yield are we using? 42% on land, and 30% in oceans (Pimm).

The Endowment Model: the biosphere as *capital*

This means that all the natural processes that produce and sustain life on earth should be viewed as a kind of capital base that produces an annual yield or 'return' of goods.

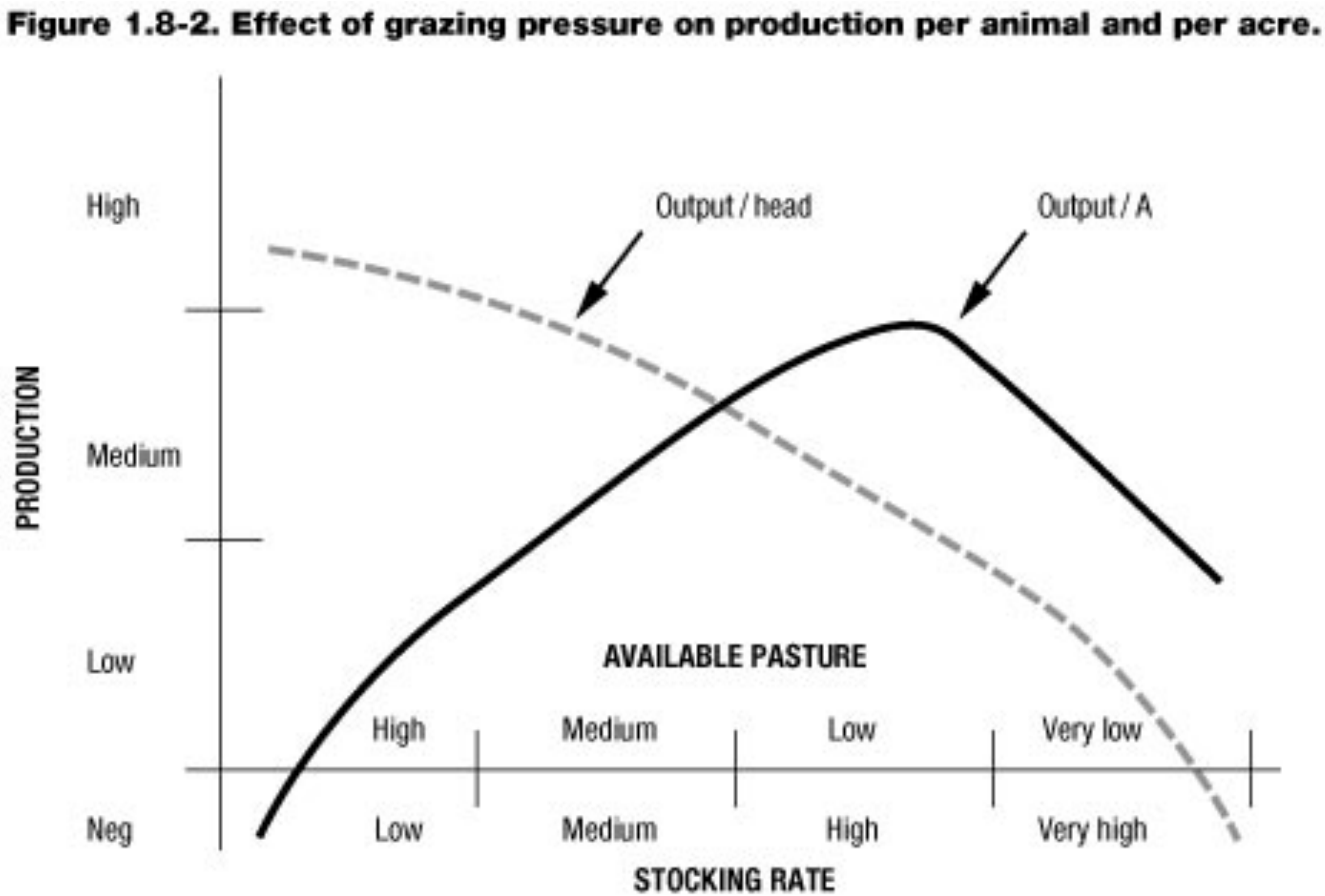
- This includes primarily the storage of sun-energy in new plant growth on land and seas, but also the generation of new species and much shorter-term ecosystem services.
- Stewards of a capital fund that is meant to exist in perpetuity are charged with (a) improving or at least maintaining *the capital base*, and thus (b) continuing or increasing the annual yield, by (c) consuming no more than this yield (less if possible) in annual operations.
- The biosphere is similar to an endowment fund under conditions of inflation in that it needs to have some of its annual yield returned to it in order to maintain its current real value.

Applied to the ecosystem, this idea is just the <u>Principle of Sustainability</u>:

1. Each year, use enough less than the annual product of the biosphere to maintain its productivity in perpetuity for future generations;
2. Do not directly degrade any part of that productivity without compensating by adding to its productive capacity elsewhere (on average over time).



Effects of Overgrazing

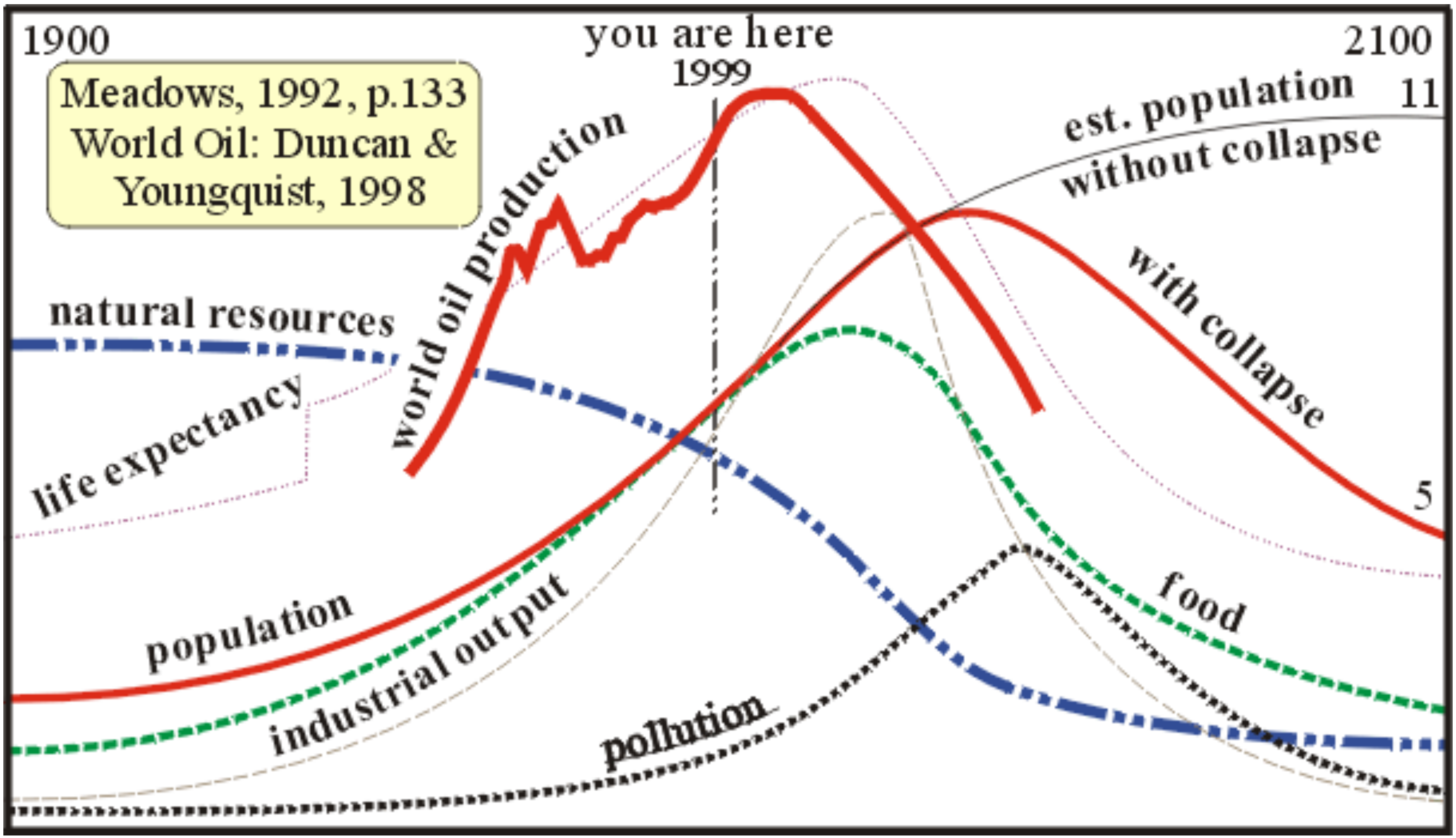


The thick black line represents output per acre of land, and the dotted line represents output per each animal.

Easter Island

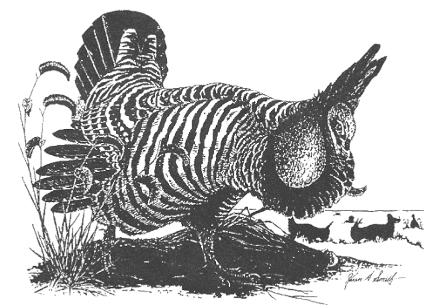
A lesson in what happens if we exceed the carrying capacity of an environment – or equivalently, use more than the annual interest yielded by an ecosystem and eat steadily into the principal of the capital base (reducing the annual yield over time, and thus speeding up the decline…).

Donella Meadows, *Beyond the Limits*, 1999

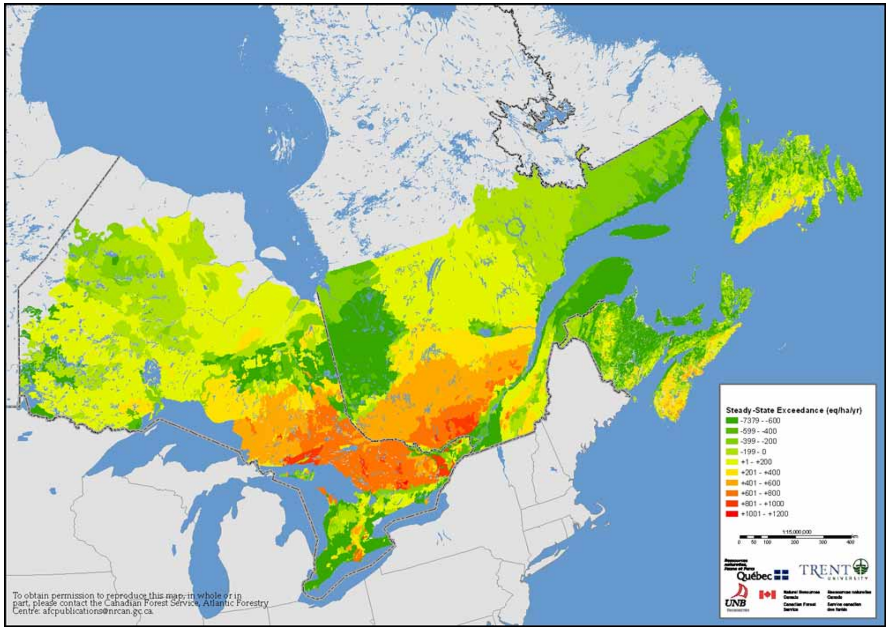


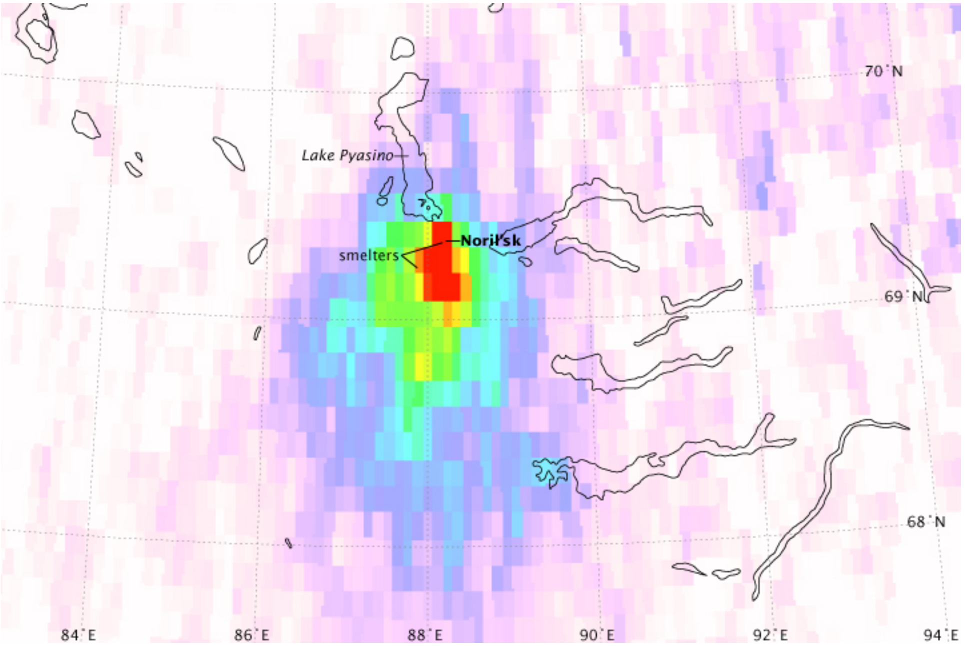
Some major global problems for sustainability

- Loss of biodiversity due to destruction of tropical rainforests, coral reefs, and loss of other wilderness ecosystems in temperate zones;
- Much of the available arable land utilized; 42% of land photosynthesis used or displaced by humans; shrinking arable land due to desertification and topsoil loss; irrigated lands lost at 1-2% per year due to salination; rising food prices;
- Freshwater sources: 60% of accessible freshwater runoff already used for households and industry; many rivers, lakes and aquifers already shrinking; many people already lack access to clean water, thus more disease and child mortality;
- Global warming; loss of glaciers and ice caps; sea-level rise, weather disruptions (storm intensity, flooding, increased desertification)
- Increasing human population (perhaps peaking at 10 – 11 billion by 2080 *and increasing per capita* environmental resource usage (eco - footprint).



Acid Rain Damage to Forests





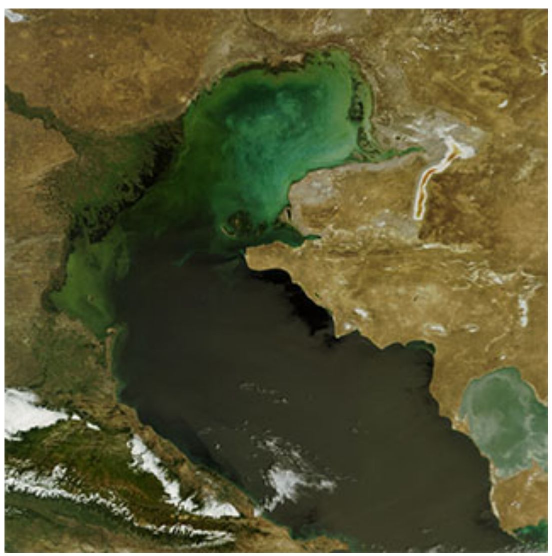
The image on the left shows acid rainfall in Canada, which is degrading soil mineral deposits on which forests depend for growth.

The image on the right is from Russia: it shows concentrations of sulfur dioxide from the Noril’sk facility, measured by the Ozone Monitoring Instrument on NASA’s Aura satellite. The measurements are for the months of June through August from 2005 through 2007. …

Large amounts of sulfur dioxide cause eye irritation, respiratory damage, and acid rain. Around the Noril’sk mining facility, expanses of dead forest testify to the acid rain’s impact. Starting in 1968, tree death increased steadily each year. By 2007, at least 1.2 million acres (4,850 square kilometers) of trees had died. A 2003 study found that the trees with the highest concentration of sulfur in their needles occurred in the most heavily damaged parts of the forest—closest to the smelting factory.

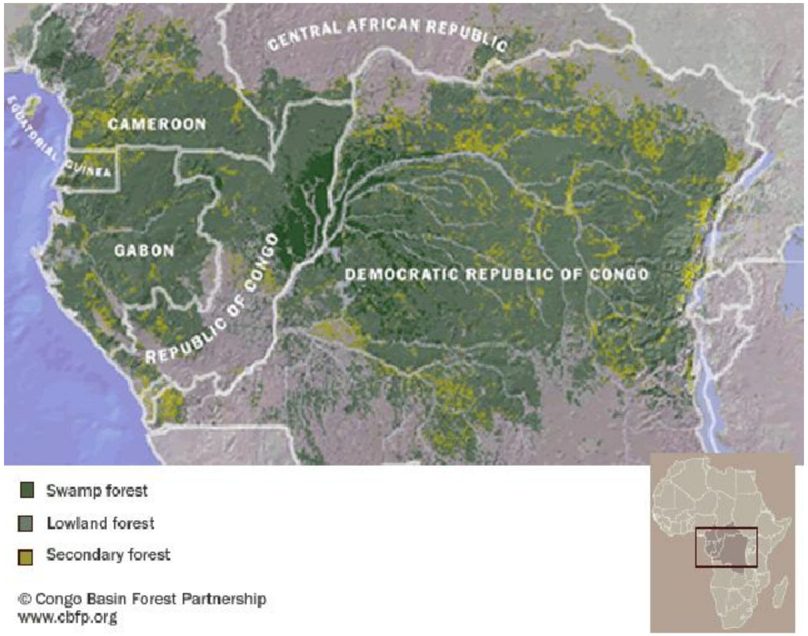
Deforestation and Water Pollution

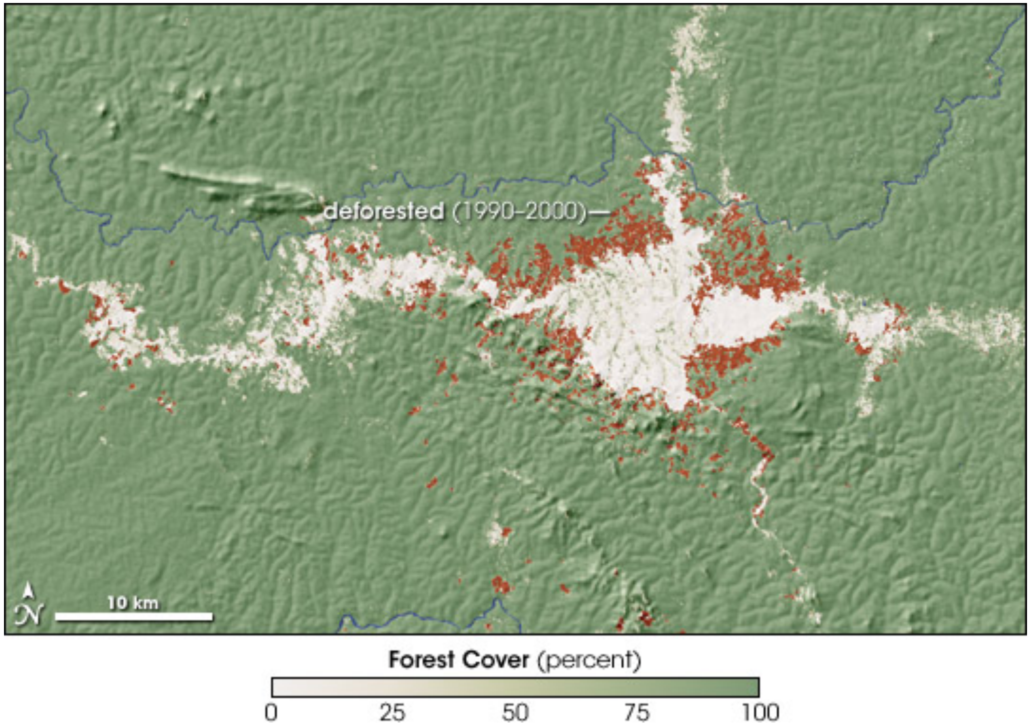
1. Mining in Peru
2. Watershed near city in India.
3. Runoff into Caspian Sea.
4. Salt from rising water table in south central Australia



Agricultural runoff and Salt-degraded lands.

Deforestation

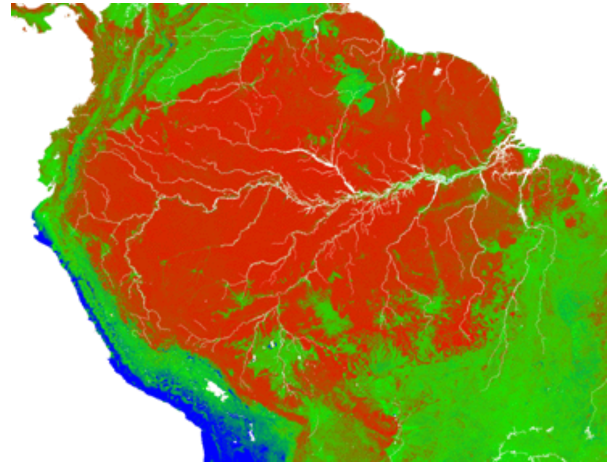




-- loss of forests in the Congo Basin, Africa

Deforestation continued

September 9, 2000



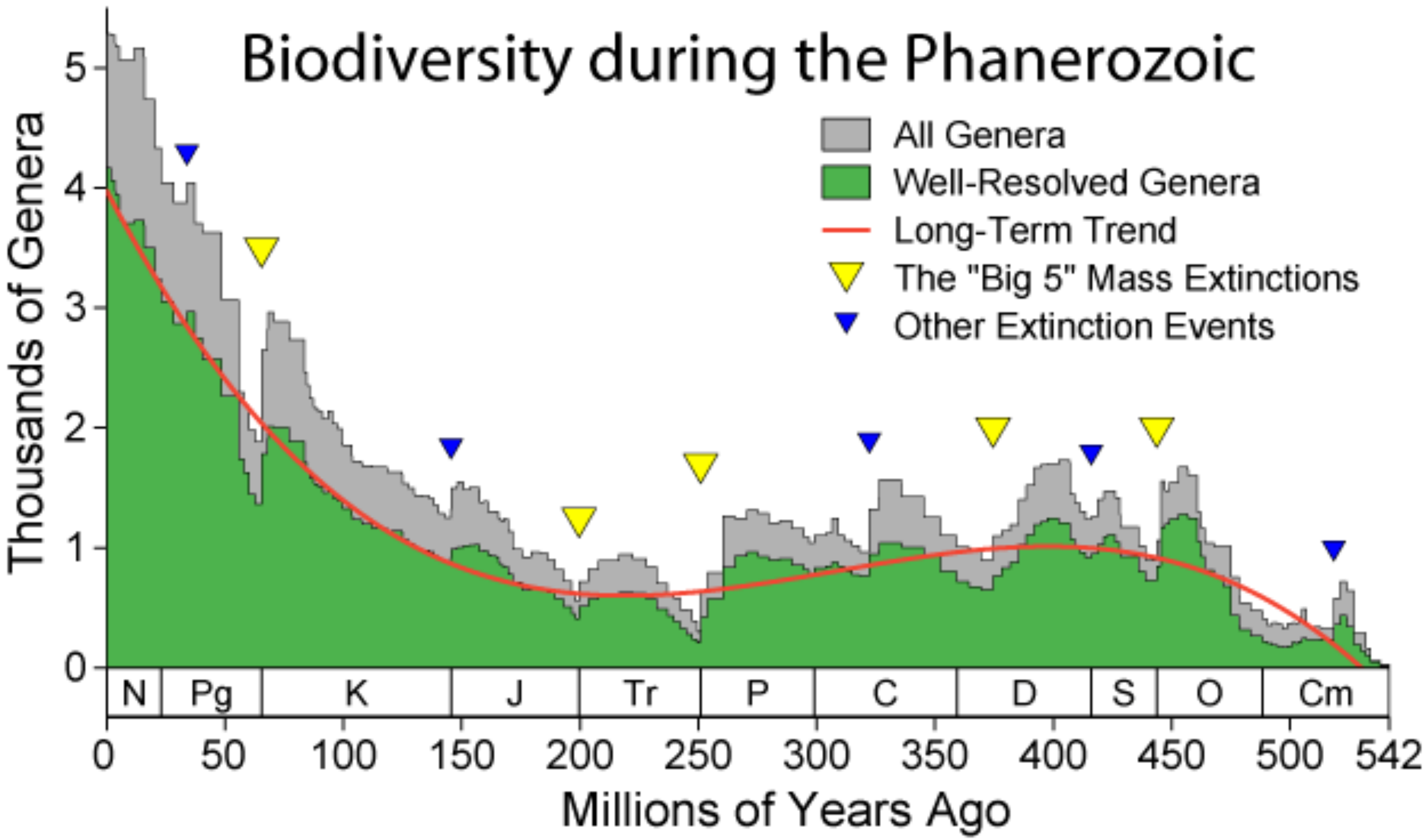
September 26, 2006

Normalized Difference Vegetation Index

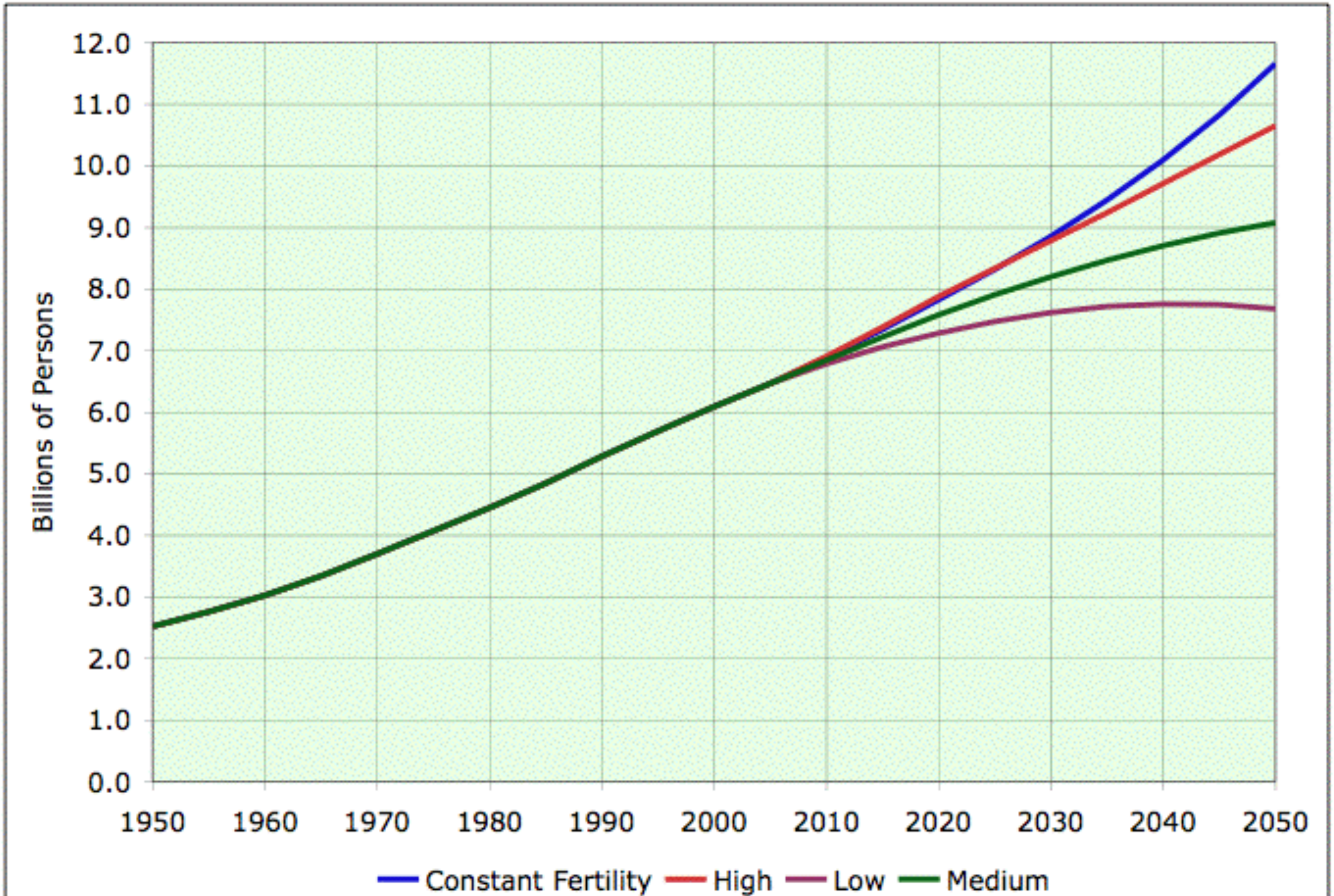
0 0.2 0.4 0.6 0.8

-- loss of Amazon rainforests in Brazil, South America

Total Biodiversity and Extinctions



UN Population Trend Estimates



-------- likely

-------- maybe

Prisoner's Dilemma (Singer's version)

Remember that if you are against the police (on the side of the prisoners), time in prison = *negative utility*. Likewise when the game is humans *against nature*.

Second Prisoner's moves	First Prisoner's moves Do not confess	 Confess
Do not confess	Prisoner One: 3 months Prisoner Two: 3 months (total = 0.5 negative utils)	Prisoner One: 0 years Prisoner Two: 8 years (total = 8 negative utils)
Confess	Prisoner One: 8 years Prisoner Two: 0 years (total = 8 negative utils)	Prisoner One: 5 years Prisoner Two: 5 years (total = 10 negative utils)

Note three key points:

- When each player directly pursues his or her maximal advantage, both confess and are worse off than they could have been if they neither confessed.
- Thus from the player's perspective, the outcome is suboptimal.
- If they could somehow cooperate, they would *each* be better off, and the total negative utility would be minimized.

Hunter's Dilemma (evolutionary version)

Singer notes three possible ways to get out of the PD: trust based on reliable sanctions for non-cooperation or defection; altruism (caring about total utility more), and a sense of duty to one's fellow Hunter (based on their past cooperation). All apply in his next example:

Second hunter's moves	First Hunter's moves Stand / fight the big cat	Run away
Stand / fight the big sabertooth cat	Hunter One: 95% chance Hunter Two: 95% chance (total 1.9 positive utils)	Hunter One: 100% chance Hunter Two: 2% chance (total = 1.02 positive util)
Run away	Hunter One: 2% chance Hunter Two: 100% chance (total = 1.02 positive util)	Hunter One: 50% chance Hunter Two: 50% chance (total = 1 positive util)

Note two key points:

•If these early humans were disposed to cooperate, they would more often survive to reproduce more.

•In addition to biological predisposition, cultural norms and social expectations (e.g. an *honor code*) might evolve to inculcate a duty to cooperate in such cases.

Assurance Game –Sandler's Version

This is also sometimes called a "stag hunt" scenario. Cooperation is more likely in this sort of game than in PD.

Person A's moves	Person B's moves Do not contribute	Contribute
Do not contribute	Person A: 0 Person B: 0	Person A: 0 Person B: -8
Contribute	Person A: -8 Person B: 0	Person A: 4 Person B: 4

Note two key points:

- If you think the other is likely to contribute, you will also gain from contributing.
- If you contribute when the other does not, your contribution is wasted.
- See connections to "weakest link" among the contributors (p.47).

Chicken Game –Sandler's Version

What distinguishes this game is that you are worse off if both parties defect than if you are the only party to cooperate. So if you think the other will defect, you are better off cooperating. However if you think the other will cooperate, you can gain by defecting.

Person A's moves	Person B's moves Hold ground (defect)	Swerve (cooperate)
Hold ground (defect)	Person A: 1 Person B: 1	Person A: 4 Person B: 2
Swerve (cooperate)	Person A: 2 Person B: 4	Person A: 3 Person B: 3

Note two key points:

- It is in at least one party's interest to cooperate (compare least cost provider…).
- If you think the other will blink or swerve, it is in your interest to press on (free ride)

Market Externalities (Sandler)

- Agent A's economic activity to produce some product P causes a harm or benefit to another party B *that is not reflected in the price of P*.
- Market dynamics alone will not price in the externality; it requires collective action (usually via law, regulation) to take account of it.
- Pollution is the most well-known of such market externalities (see p.23 ex.)
- The government can correct this by adding taxes to products that involve negative externalities, or subsidizing those with positive externalities.
- Or the government can set a cap on the total amount of the externality to be allowed and then sell permits to produce it, leaving markets to assign them.
- However, this leaves a huge problem with *transnational externalities* (p.42).

Market Failures and Public Goods (Sandler)

In general, I argue that wherever we have a *collective action problem* (CAP), there is a corresponding **public good** that is needed for an optimal outcome, but that is not reliably/stably produced by market dynamics alone (because of the CAP).

-- Sandler instead distinguishes externalities and public goods as two sorts of market failure, and adds unowned "commons" as a third cause of market failure.

-- Sandler gives the standard economic definition of **public goods** in two features:

• *Non-excludable*: no (efficient) way to keep non-payers from enjoying the good once it is produced for some users. (We can add: and a large number of users want it).

-- consider common defense of a nation, a river or lake cleanup, or interstate highway.

• *Non-rival:* use of the good, or benefit from it, by one party does not (significantly) detract from the ability of others to use or benefit from it. (This is what was meant in by the concept of a common good – no zero-sum game or tradeoff between users).

-- consider parks, public knowledge, the earth's ozone shield, world biodiversity.

These features cause the sort of payoff spreads we see in familiar CAPs (PD etc.)

"Tragedy of the Commons" (Dodds)

This concept, first rigorously described by Garrett Hardin, has often confused students, since it seems to imply that wilderness is bad, or that all beneficial parts of the biosphere need to be *owned* to be protected. But that does not always follow. In general, the "tragedy" of overuse of assets is a set of several interrelated CAPs that occur with non-owned productive assets when

(a) to capital that is *depletable or degradable*, and

(b) where the CAP could be solved by either private ownership (where the benefits are excludable) or public ownership and control (when benefits are not efficiently excludable).

Examples

- The term originated from overgrazing of "common" land in European villages
- Consider now the overfishing of oceans and seas that are "global commons."

Mixed Game Version of Tragedy of Commons

Define T = the total annual usage of a productive environmental asset that is *sustainable,* i.e. repeatable each year without degrading the capital base.

Define P = the total number of persons using that environmental asset.

Define S as the average sustainable usage, so that P x S = T. Let's say S = 3 and P = 2.

Person A's moves	Person B's moves **Defect:** **Use commons at a rate >S**	**Cooperate:** **Use commons at a rate <= S**
Use the commons at a rate >S [= defection]	Year 1 Year 2 Year 3 Year 4 A: 5 + 3 + 1 + 0 = 9 B: 6 + 4 + 1 + 0 = 11 **20**	Year 1 Year 2 Year 3 Year 4 A: 5 + 5 + 3 + 0 = 13 B: 3 + 3 + 2 + 0 = 8 **21**
Use the commons at a rate <= S [= cooperation]	Year 1 Year 2 Year 3 Year 4 A: 3 + 3 + 1 + 0 = 7 B: 6 + 6 + 2 + 0 = 14 **21**	Year 1 Year 2 Year 3 Year 4 A: 3 + 3 + 3 + 3 = 12 B: 3 + 3 + 3 + 3 = 12 **24**

- Both parties are worse off if in the long run if neither cooperates than if both do.
- Yet each does best (in the medium term) where they "free ride" when other cooperates.
- That means (if no years beyond 4 are relevant) this is a Prisoner's Dilemma.
- So the problem becomes worse the more parties *discount* future costs/benefits.

An example: the drying out of ancient Mesopotamia from overgrazing (see Diamond, *Guns, Germs and Steel*)

http://www.youtube.com/watch?v=Se-ina_bhJ0&feature=related Fertile Crescent (2.2 in)

http://www.youtube.com/watch?v=gBHs_1_xCN8&feature=related The burnout of land.

Ultimatum Game

This game is a little different in that the players' possible moves are not of the same kind, because the second player can only accept or reject the offer made by the first player, who gets to go first (and Player A actually has many possible moves between $0 and $100).

Person A's moves: **Player's B's moves:**	**Defect:** **Offer little of the $100 given**	**Cooperate:** **Offer close to 50% of the $$**
Reject offer [= defection]	A gets $0 B gets $0 Total: **$0**	A gets $0 B gets $0 Total: **$0**
Accept offer [= cooperation]	A gets $90 (for example) B gets $10 (for example) Total: **$100**	A gets $60 (for example) B gets $40 (for example) Total: **$100**

- Because the choice in the upper-right quadrant is unlikely, it can be largely ignored.
- There is no difference between both cooperating or only B cooperating in total utility.
- So this is not exactly a PD or Assurance Game.
- It seems like the bottom left quadrant is the only equilibrium, because A reasons that B should take whatever she gets. But in fact, real people playing B typically reject such low offers (or punish A for defecting) – which provides an evolutionary mechanism for cooperation when situations like this are repeated over time.
- However, it also suggests that real people playing A don't see equal division of lucky benefits as important.

“Public Goods” Game

Dodds describes a four person version of this game because the decision to cooperate (invest) is independent of assurance that others are investing equally before the pot is doubled and divided equally among all. I’ll consider a three person variant that is easier.

Person A: Starts with $100	**Person B: Starts with $100**	**Person C: Starts with $100**
Invests $100 in the common pool to be doubled (full cooperation)	Invests $65 in the common pool to be doubled (partial cooperation).	Invests $0 in the common pool to be doubled (total defection).
Ends up with $110 (a third of the doubled pot plus her uninvested money, which is $0).	Ends up with $145 (a third of the doubled pot plus his uninvested money, which is $35).	Ends up with $210 (a third of the doubled pot plus her uninvested money, which is $100).

- The pot is the total combined investment = $165. It is doubled to $330, which represents the *benefits of pooled resources* in many human situations (e.g. where a large investment is needed for a public project, e.g. lighthouse.
- The division of the doubled pot into three equal shares represents the *non-excludability* of the good (the pot).
- Notably, this game does not model *non-rivalry* because the doubled pot is divided up. If the result were some scientific breakthrough that provided public domain knowledge useable in new technology, it would be non-rival.
- If we graphed all the permutations, it would be clear that this is an Assurance game.
- Thus the tragic fact that after ten rounds, almost all players invest nothing into the pot because (unlike A) they end up worse off from investing: the more players there are, the more a few defectors totally ruin it for all.

Justice considerations in CAPs

Sandler sets aside considerations of justice in his economic analysis, though he acknowledges that commitment to fairness, honoring contracts or promises, or loyalty may help us escape from CAPs. This is related to Dodd's point, in reply to Hardin, that for some small-scale CAPs, solutions other than institutional enforcement via law may work.

In particular, there is apparent injustice whenever one or more party free-rides (they defect while others cooperate). Consider two of the game scenarios where Sandler thinks this most likely:

(a) In "chicken," if either party is slightly more risk-averse, they will blink first and bear the full cost of avoiding the "collision," which benefits all the parties.

(b) In "best shot" games, the overall public good will be equal to the *largest individual party* contribution – as can happen when what counts is the first effort that surmounts a key threshold. It seems in such cases that others who benefit ought to share the provider's costs.

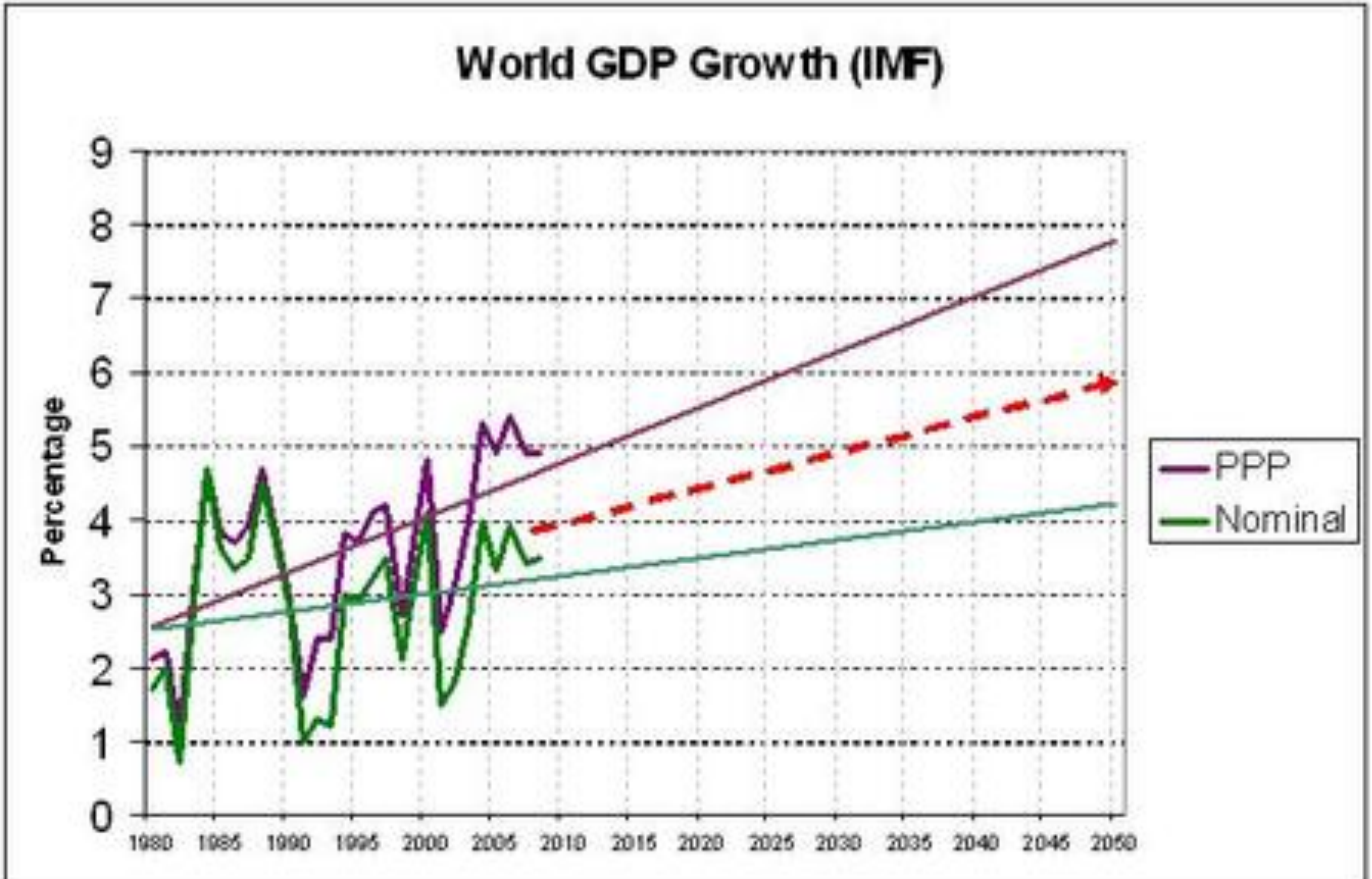
Other cases where justice issues arise: thresholds

- *Threshold effects:* if enough parties will contribute in an Assurance Game to get us to the point where the total investment is enough to get over a key threshold, the public good will come about, even though others cheat (pay nothing and still use or benefit from the public good).
- *Unequal contributions:* If party A knows that B and C will each contribute no more than $30 (though all are *equally able* to pay) and the threshold is $100, then party A may contribute $40 to get over the threshold and thus benefit from a public good, which is (say) worth $50 to each. This is unfair to A, since B and C are partially free riding on A, who chooses last.
- *Wasted contributions:* an especially bad feature of some scenarios with both thresholds and asymmetric moves (the parties do not choose simultaneously) is that any contributions of the first- or earlier-moving players may be lost if the common total is not enough to get over the threshold. This makes it harder to assure the earlier investors/contributors enough.

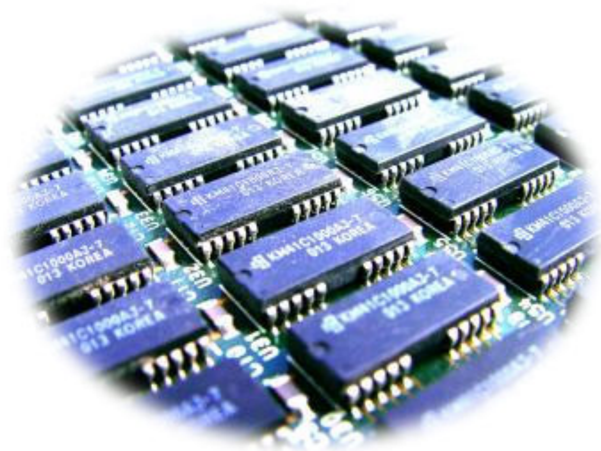
Rischard: *High Noon*

Population Increase implications:

- Continued movement to large cities
- World food production increase by 40% from 2001 - 2020
- Meat production increases 60% (requires 10 x more grain than cereals)
- Exhaustion of aquifers
- Further increases in carbon emissions accelerating in developing nations
- Power usage *doubles* between 2001 – 2020
- Aging populations
- Wealth gap


World GDP Growth (IMF)
Percentage
9
8
7
6
5
4
3
2
1
0
1980
1985
1990
1995
2000
2005
2010
2015
2020
2025
2030
2035
2040
2045
2050
PPP
Nominal

Rischard: *High Noon* chs.3-5



New World Economy:

- Globalization of free markets, hypercompetitive environment
- Computing revolutions, internet, productivity increases, shared knowledge
- Alliances and long chains of production in globally connected businesses
- Increasing ecommerce and ebusiness; rich content pushed over long distances
- Faster rates of economic change, business requires transnational networking
- Increasing inequalities between nations and within nations (given thresholds)
- Turbulence, possibility of cascading market failures rippling across globe
- Excessive trust in market-driven growth with loss of government steering power
- Increasing per-capita usage of environmental resources, stress on biosphere

The vicious feedback loop for governance

Economic globalization expands

Faith in markets grows

Reduces gov. ability to address major problems, slows pace of structural reforms in government.

Government ineffective, loses steering power, public frustration.

Desjardins: *Duties to Future Generations*

Getty Images

Two Moral Topics:

- Population Policy: future population size, controls on growth, optimum?
- Duties to posterity: what do we owe those who do come to exist in future (50-100)?

Critiques of Duties to Posterity:

1. Argument from ignorance: we do not know who will exist, that they will exist, what their preferences will be etc.

   -- Answers: theory of basic goods, welfare, responsibilities for negligent harms
2. Disappearing beneficiaries: our policy decisions change who will be born, so it is not the same people who will be better off or worse off due to these policies.

   -- Answers: Baier: persons better off not born, rights of all possible future persons.

   -- Warren: avoidable suffering of whatever future persons exist (or rep. types?).
3. Temporal location: the intuition that we may prefer present over future interests

   -- Answers: familiar responsibilities for time-delayed but inevitable harms.

Puzzles about Duties to Future People

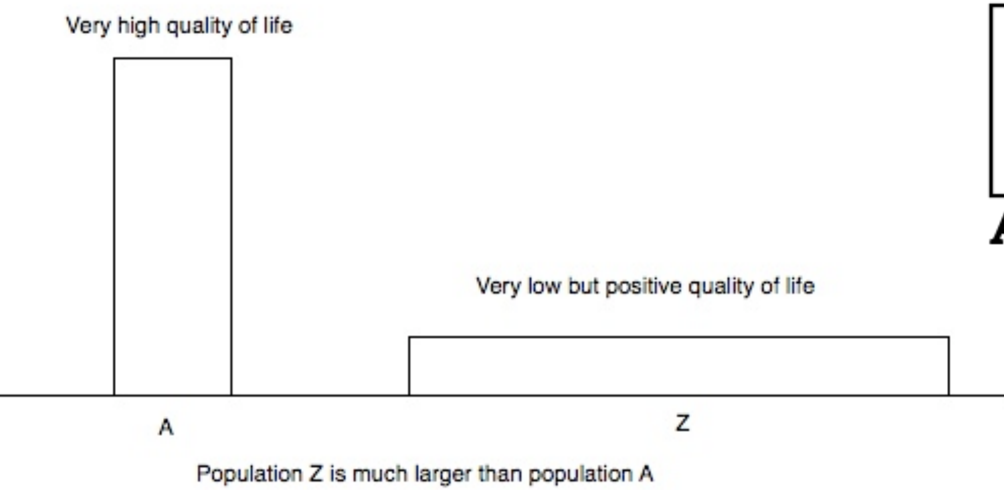
- *Human history and culture as a whole:* would we be violating a basic obligation if we all became celibate and allowed human beings to become extinct? If so – if humanity itself is worth preserving in perpetuity, along with its cultural inheritances – then what of other species, wilderness, eco-diversity?
- *Discounting:* classical economics and utilitarian theory discounts future costs and benefits, given people's preference for present consumption (cost for waiting to consume, which = interest rate). Recommends using more resources sooner.

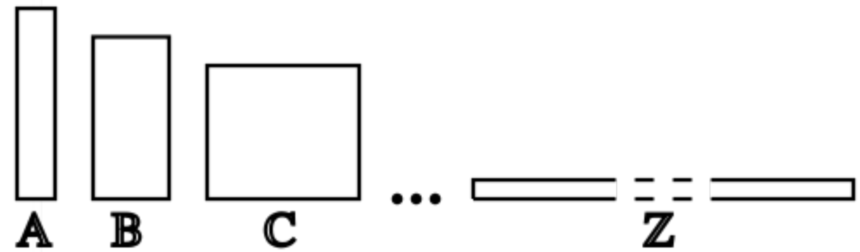
  -- Response 1: any discounting, however small, makes future costs and benefits equal zero far enough in the future.

  -- Response 2: life, health (maybe other goods, e.g. living species) are not to be discounted at all.

  -- Response 3: M. Williams' argument that sustaining *productive resource bases* of any type in perpetuity always maximizes utility in the longest-run scenario (a difference between consumer goods and goods that naturally have a *capital role*).
- *Total or Average Utility maximized?* Yet utilitarian theories recommending that we maximize total collective happiness through all future times may have counter-intuitive implications for population policy questions: this might imply that we should promote the largest sustainable population possible at subsistence levels, where adding one more person increases total costs more than it increases benefits. This is called the *repugnant conclusion*.

Parfit's *Repugnant Conclusion* explained





Simplified Version on Left **Parfit's original version on right**

- A: 100 people each enjoy average 50 units of happiness over their lifetime = total utility of 5000
- B: 200 people each enjoy average 35 units of happiness over their lifetime = total utility of 7000
- C: 500 people each enjoy average 25 units of happiness over their lifetime = total utility of 12500
- Z: 10000 people each enjoy average 2 units of happiness over their lifetime = total utility of **20000 [the maximum]**
- If we go over sustainable limits in this scenario: 10100 people each enjoy ave 1.9 units of happiness over their lifetime = total utility of 19190, which is worse.

Duties to Future People continued

- *Average Utility:* this version has the offensive implication that people in poorer nations should have fewer children than people in richer nations since that is most likely to maximize average human happiness in the foreseeable long run.
- *Problems with "rights" of future people:* if future people do not exist, they cannot have rights.

  -- Response: the rights would be held not by particular individuals but by whoever occupies certain roles in future society; these rights are like those of an office.
- *Nonrenewable environmental resources* such as fossil fuels: these resources will run out some time in the future if they are used at all by present people.

  -- Response: Barry's *equal access to productive capacity* principle. This principle is a version of Locke's famous "proviso" that we can acquire property by taking things from nature and laboring upon them, but only if "enough and as good" is left for others in the future. If not, they must be compensated for their loss.

Desjardins' conclusions on what we owe to future

1. To develop alternative renewable energy sources – r&d
2. Conserve nonrenewable resources to the extent feasible.
3. Preserve wilderness, species, other objective environmental goods the effectively permanent loss of which cannot be *compensated for* by economic goods resulting from economic growth.

Desjardins goes on to consider two other ethical models related to these points:

- Virtue and caring – Nel Noddings' conception of non-egoistic concern.
- Human eudaimonia is enhanced by biophilia, just as by love of aesthetic goods.

He then concludes with a discussion of sustainable *development vs. growth.*