

Lecture Springsemester 2015 M. Dittmar  
Energy and environment in the 21. century: Part II  
<http://ihp-lx2.ethz.ch/energy21/>  
April 17, 2015

**Lecture 7 (shorter version)**  
**(Block II: Options for the future CERN dates below**

**Which path into sustainability?**

**BAU = Business as usual (April 8);**

Green Economy (April 22);

Collapse (May 13);

**“A rational development towards sustainability”:**

Examples of sustainable systems (May 20);

Sustainability and human nature, moral-ethics-earth care and a rational policy towards sustainability (May 27)

# Within the physical possibilities A sustainable “World we want”

- Today's (our global?) economic system is unsustainable!  
Our destructive  $\text{Impact(PAT)} = \text{Population} \times \text{Affluence} \times \text{Technology}$  is too large.
- The transition into a sustainable system is unavoidable.
- Transition into sustainability through regional/global system collapse
- Our goal: A rational local/global “development towards sustainability” strategy following theoretical principles and natural laws for the unknown rational path into a sustainable system.

“Development towards sustainability”: What is more important?

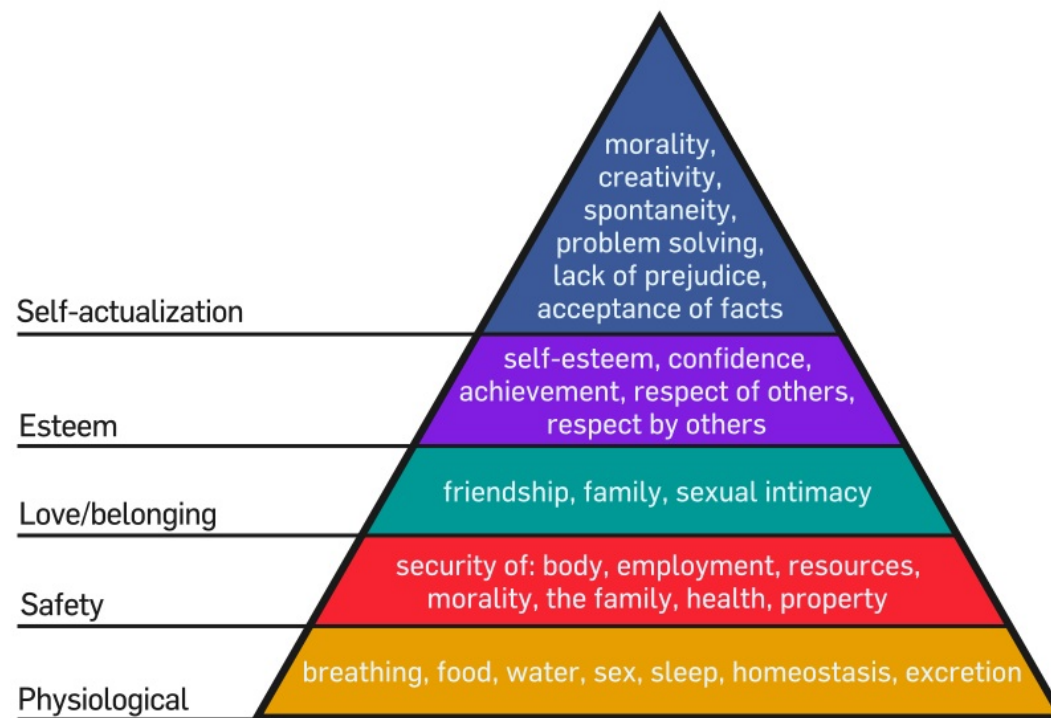


# “A World we want” (locally and globally)

## A good and sustainable life: theoretical ideas (1)

Minimum requirements for a sustainable and “good” life?

Maslow’s hierarchy of needs [http://en.wikipedia.org/wiki/Maslow's\\_hierarchy\\_of\\_needs](http://en.wikipedia.org/wiki/Maslow's_hierarchy_of_needs)



In a functioning society for all, the basic elements could easily be achieved today. But, even the richest countries have not achieved “water”, “food” and “shelter” for all!

See [http://en.wikipedia.org/wiki/Child\\_poverty](http://en.wikipedia.org/wiki/Child_poverty):

Quote: “However, in 2013, child poverty reached record high levels in the United States, with 16.7 million children, more than 20%, living in food insecure households. 47 million Americans depend on food banks, more than 30% above 2007 levels.”

# “A World we want” (locally and globally)

## A good and sustainable life: theoretical ideas (2)

Perhaps the most important physiological criterium for human life:

- about 2500 Calories/day/person with many regional/historical/cultural more or less healthy variations (vegetarian or not).
- Most “experts” believe: Healthy food requires a large fraction of different fruits and vegetables

### Enough healthy food for how many people/km<sup>2</sup>?

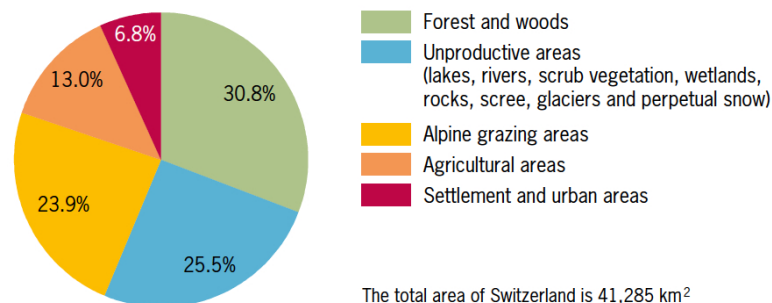
today: a maximum of 10 people/ha (10 000 m<sup>2</sup>) agriculture area.

Example Switzerland: More than enough food for 8 million people. But, the Swiss system is unsustainable:

- (1) about 10 hidden Calories in every eatable Calorie and
- (2) about 50% of the food is imported (about 500 000 “ghost” ha often far away!)

#### Land use

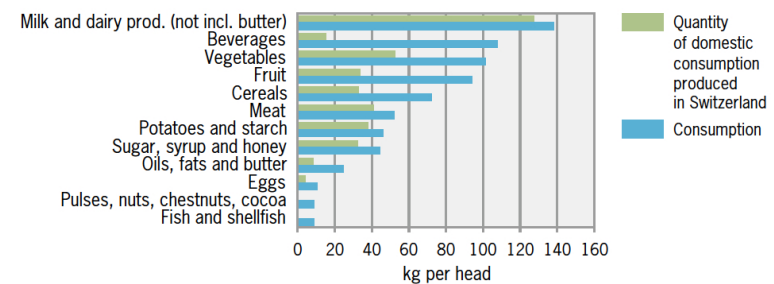
Areas surveyed between 1992 and 1997



The total area of Switzerland is 41,285 km<sup>2</sup>

© FSO

#### Food consumption<sup>1</sup>, 2009



<sup>1</sup> Does not represent quantities actually consumed as losses (e.g. unsold or spoiled food) are not recorded completely.

Source: Swiss Farmers' Union

© FSO

## “A World we want” (locally and globally)

### A good and sustainable life: theoretical ideas (3)

Food in Switzerland, some important numbers:

Suisse agriculture: about 400 000 ha (plus “700 000” ha mountain “cow” prairies). [http://www.swissworld.org/en/economy/farming/facts\\_and\\_figures/](http://www.swissworld.org/en/economy/farming/facts_and_figures/)

Today's food production/consumption requires an additional 500 000 ha good agricultural land.

Today's scientific(?) but unsustainable agriculture system requires at least 1000 m<sup>2</sup>/person/year with .

**In theory: an established “sustainable bio-intense” (hand labor!) local system:** a self-sufficient “Suisse” fruit/vegetable/potato diet could function with only 100 m<sup>2</sup>/person/year (and with an average of 3 hours “work” /m<sup>2</sup>). Plus 300 m<sup>2</sup>/person/year for wheat, vegetable oil and animals.

**but who wishes, has the know how and the time and access to land to develop such sustainable prototypes of self-sufficient food production?**

# **“A World we want” (locally and globally) A good and sustainable life with real people today?**

**today's real people live in “large scale groups” (cities):**

- Organised in “Top-down” power/richness structures (often even on the family level with a violent male dominance!);
- **The “top class” often demonstrate a “slave owner” mentality (if possible with mechanical slaves, if not with real slaves!);**
- Within our philosophical thinking we learn that this top-down system is the only “natural” large scale system.
- **Most people believe (or want to believe) to be members of the “middle class” group. Most of us believe in a “just” distribution system of resources (natural capital) within our “clan, social group and country” .**
- Insane, bad and dangerous “monsters” are a minority (under unstable social conditions such monsters can achieve unbelievable political power!)

Hoping that Einstein was not only right with the “neutrino velocity” but also here:

**“The world is a dangerous place to live; not because of the people who are evil, but because of the people who don’t do anything about it.”**

# Natural Scientists and the Future: The BAU scenario brings ruin to all of us!

## World Scientists' Warning to Humanity (1992)

Some 1,700 of the world's leading scientists, including the majority of Nobel laureates in the sciences, issued this appeal in November 1992.

<http://www.ucsusa.org/about/1992-world-scientists.html>

- Human activities inflict harsh and often irreversible damage on the environment and on critical resources. **If not checked, many of our current practices put at serious risk the future that we wish for human society and the plant and animal kingdoms, and may so alter the living world that it will be unable to sustain life in the manner that we know. Fundamental changes are urgent if we are to avoid the collision our present course will bring about.**
- We the undersigned, senior members of the world's scientific community, hereby warn all humanity of what lies ahead. **A great change in our stewardship of the earth and the life on it is required, if vast human misery is to be avoided and our global home on this planet is not to be irretrievably mutilated.**

# Growth, growth forever? (1)

## our political “World Leaders” (our decision makers)

Some quotes:

- “The most important thing that the United States can do for the world economy is to grow, because we continue to be the worlds largest market and a huge engine for all other countries to grow.”  
U.S. President Barack Obama Talks Economy Issues at the G20 meeting (Nov 12, 2010).
- “Wettbewerbsfähigkeit sei kein Wert an sich, aber Voraussetzung für nachhaltiges Wachstum.” A. Merkel (15.3.2013) and  
Merkel and Sarkozy: *Merkozy träumen von Wachstum und Jobs* (2012)  
<http://www.youtube.com/watch?NR=1&feature=endscreen&v=oaGsUIRZONk>
- “We have spoken on many occasions of the need to achieve high economic growth as an absolute priority for our country.” W.Putin (May 2006)  
[http://archive.kremlin.ru/eng/speeches/2006/05/10/1823\\_type70029type82912\\_105566.shtml](http://archive.kremlin.ru/eng/speeches/2006/05/10/1823_type70029type82912_105566.shtml)
- “I don’t think we will be able to sustain an ultra-high speed of economic growth and it is not what we want either” .... but China will “sustain a relatively high speed”  
Xi Jinping (new President of China), (8.4.2013)
- “Growth has slowed to 5 percent, which is clearly disappointing ... . We are seeing temporary downturn, partly due to global factors. We can get back to 8 percent growth rate”. India’s Prime Minister Manmohan Singh, (3.4.2013)



# Growth, growth forever? (2)

## our political “World Institutions” (where decision are made)

Speeches from the Weltbank Leader <http://www.worldbank.org/>

Living in a Changing World: World Bank Managing Director Caroline Anstey's (April 2, 2013)

<http://www.worldbank.org/en/news/speech/2013/04/02/living-in-a-changing-world-world-bank-managing-d>

- A rising global middle class will ratchet up demand for energy, natural resources, food, and water, with climate effects exacerbating food and water shortages in some areas. Demands will change. Its already evident in East Asia on the food front. The importance of rice is on the decline in all countries, while demand for meats, fish, poultry, fruits and vegetables and processed foods is on the rise.
- If this rising middle class consumes the same overall as rich countries do today, **by the middle of this century we will need two worlds instead of one.** Managing this rising demand while allowing developing countries to grow is, in my view, the defining challenge of our time.
- Climate change will only serve to amplify existing resource stresses. **On current trajectories, half of the global population will be living in water scarce countries by the end of the century and 35 percent of Sub-Saharas cropland will become unsuitable for cultivation, with severe impacts on food security.** The worlds farmers will need to produce 70 percent more food by 2050 to feed a population expected to pass nine billion people.

## Growth, growth forever? (3)

### our political “World Institutions” (where decision are made)

Examples: Worldbank reports <http://www.worldbank.org/>

- PRESS RELEASE April 15, 2013  
“Africa Continues to Grow Strongly Despite Global Slowdown, Although Significantly Less Poverty Remains Elusive”  
**“Africas impressive growth has not reduced poverty enough”**
- “Africas Pulse says that recent discoveries of oil, natural gas, copper, and other strategic minerals, and the expansion of several mines or the building of new ones in Mozambique, Niger, Sierra Leone, and Zambia, together with better political and economic governance, were sustaining solid economic growth across the continent.”

#### **Future offers prospects of more growth, much less poverty, and shared prosperity**

“Africas Pulse suggests that a number of emerging trends on the continent could help to transform its current state of development over the coming years. **These include the promise of large revenues from mineral exploitation, rising incomes created by a dramatic expansion of agricultural productivity, the large-scale migration of people from the countryside into Africas towns and cities”**

# Growth, growth forever? (4)

## our political “World Institutions” (where decision are made)

the Internationale Monetary Fund <http://www.imf.org/external/index.htm>

C. Lagarde Rio 2012 <http://www.imf.org/external/np/speeches/2012/061212.htm>

*“Today, I believe that we are facing a triple crisis: (1) an economic crisis, (2) an environmental crisis, and, increasing, (3) a social crisis.”*

(the result of 20 years IMF policy of “sustainable development” !)

<http://www.imf.org/external/np/exr/facts/enviro.htm>

**FACTSHEET** Climate, Environment, and the IMF (April 12, 2013)

*“Stabilizing atmospheric concentrations of greenhouse gases will require a radical transformation of the global energy system over coming decades.”*

The Global Policy Actions Needed to Stay Ahead of the Crisis By Christine Lagarde Managing Director, International Monetary Fund Economic Club of New York, New York, April 10, 2013

<http://www.imf.org/external/np/speeches/2013/041013.htm>

- (c) Growth, jobs, and equity  
all countries need to emphasize more growth, jobs -and more equity. In other words, more attention to the issues that really matter to people. This is something we take very seriously at the IMF. With over 200 million people out of work today, job creation is an urgent priority... The best way to create jobs is through growth.
- “We know the future we want. We know the path to get there. The task before us now is to act, to make that future a reality, to get ahead -and stay ahead- of the crisis.” (I guess that is what she means: (<http://www.tradingeconomics.com/greece/unemployment-rate>))

# Arguing against natural science is difficult (1)

The classic method in the civilised world: Accept science as the basics for a discussion but:

1. ignore the most important scientific statements and after some time remove the statements from its context and misinterpret it.  
Example: Statements from the 1972 book “the limits of growth” (Meadows et al.) are ignored, misinterpreted and joked about;
2. divide the scientific world into “optimists and pessimists;
3. accept that some problems exist and that we need to understand them in detail. Finance such projects with tax-payers money with the goal to bind and occupy critical scientists into the process to get more and better data.
4. Find scientists (experts) who are arguing against the dangers of smoking, asbestos, radioactivity, pesticides, man made climate change etc.  
Give those “experts” enough time in the media and especially into entertaining talk shows with ideas from opposing experts.

Examples:

“The Rational Optimist” (Matt Ridley) 2010 <http://www.rationaloptimist.com/>

“The skeptical environmentalist: Measuring the real state of the world (B. Lomborg 2001)  
[http://en.wikipedia.org/wiki/The\\_Skeptical\\_Environmentalist](http://en.wikipedia.org/wiki/The_Skeptical_Environmentalist)

## Arguing against natural science is difficult (2)

The example B. Lomborg <http://lomborg.com/about/biography> und <http://lomborg.com/about/honours>

*“Dr. Bjorn Lomborg researches the smartest ways to improve the environment and the world. He is one of TIME Magazine’s 100 most influential people in the world, one of the 75 most influential people of the 21st century according to Esquire magazine, and one of the 50 people who could save the planet according to the UK Guardian. Lomborg has repeatedly been named one of Foreign Policy’s Top 100 Global Thinkers.”*

Review <http://www.scientificamerican.com/article.cfm?id=skepticism-toward-the-ske>

1. *“Lomborg, a Danish political scientist with a background in statistics, argues in his text that claims made by environmentalists about global warming, overpopulation, energy, deforestation, species loss, water shortages, and a variety of other issues are exaggerations unsupported by a proper analysis of environmental data. His message was widely publicized in the popular media and championed by political commentators traditionally opposed to environmentalist policies.”*
2. *“Outraged voices within the mainstream scientific community quickly answered, however, that Lomborg’s work was deeply flawed. His text, they said, misrepresented the actual positions of environmentalists and scientists, and his analysis was marred by invalidating errors that include a narrow, biased reading of the literature, an inadequate understanding of the science, and quotations taken out of context.”*

## Arguing against natural science is difficult (3)

Lomborg with his own words (2001):

“We need to look at realities, not myths”

- “We are not running out of energy or natural resources”
- “There will be more and more food per head of the worlds population”
- “Fewer and fewer people are starving”
- “Global warming, though its size and future projections are rather unrealistically pessimistic, is almost certainly taking place, but the typical cure of early radical fossil fuel cutbacks is way worse ..”
- “We will not loose 25-50% of all species in our lifetime -in fact we are loosing probably 0.7%”
- “Mankind’s lot has actually improved in terms of practically every measurable indicator”

**Now we are in 2015: Lets check the state of the world now!**

# Arguing against natural science is difficult (4)

(since 2008?) Lomborg talks mainly about the “harmless” climate problem.

“We need to look at realities, not myths”: What happened during the last 10 years? [http://www.unep.org/geo/pdfs/geo5/Measuring\\_progress.pdf](http://www.unep.org/geo/pdfs/geo5/Measuring_progress.pdf)

- “...deep cuts in global greenhouse gas emissions are required according to science ... with a view to reducing global greenhouse gas emissions so as to hold the increase in global average temperature below +2 C above pre-industrial levels.”
- “The world failed to reach the Millennium Development Goal target of reducing the rate of biodiversity loss by 2010.” Ever more species are threatened by extinction, including almost 20% of vertebrate species (comprising birds, mammals, amphibians, reptiles and fish). Levels of threat are increasing fastest for corals. On average, species populations are also declining worldwide vertebrate populations have declined by 30% since 1970; a continuing decline is expected.”
- “The condition and extent of natural habitats continue to decline, with some habitats experiencing declines in extent of 20% or more since 1980. Expansion of agriculture is the main reason for the loss of habitat on land, with more than 30% of the Earths land surface now used for agricultural production
- “Global warming, though its size and future projections are rather unrealistically pessimistic, is almost certainly taking place, but the typical cure of early radical fossil fuel cutbacks is way worse ..”
- “To achieve sustainable fisheries... maintain or restore stocks to levels that can produce the maximum sustainable yield with the aim of achieving these goals for depleted stocks on an urgent basis and where possible not later than 2015”

## Arguing against natural science is difficult (5)

(since 2008?) Lomborg talks practically only about the “harmless” climate problem.

“We need to look at realities, not myths”: What happened during the last 10 years? [http://www.unep.org/geo/pdfs/geo5/Measuring\\_progress.pdf](http://www.unep.org/geo/pdfs/geo5/Measuring_progress.pdf)

- “The number of coastal dead zones has increased dramatically. There are now at least 169 coastal dead zones, with only 13 recovering, and 415 coastal areas suffer from eutrophication. Eighty per cent of marine pollution comes directly from sources on land.”
- “In 2010 about one-sixth of the worlds population, an estimated 925 million people, were undernourished.<sup>65</sup> The proportion is decreasing slowly, but the absolute number is still increasing;”
- “The world lost over 130 million hectares of forest between 2000 and 2010. Deforestation is now mostly in the tropics, especially South America and Africa.”
- “The extinction risk is increasing faster for corals than for any other group of living organisms. The condition of coral reefs has declined by 38% since 1980, with a rapid contraction projected by 2050. One of the most serious threats is climate change, which is causing widespread die-off through rising temperatures and ocean acidification.”



# Arguing against natural science is difficult (6)

some recent news:

- (March 25, 2015) "Overfishing of Atlantic by EU nations continues, studies show"  
<http://www.cbc.ca/news/business/overfishing-of-atlantic-by-eu-nations-continues-studies-show-13008798>
- Hidden in an unknown corner of Inner Mongolia is a toxic, nightmarish lake created by our thirst for smartphones, consumer gadgets and green tech ... <http://www.bbc.com/future/story/20150402-the-worst-place-on-earth>
- (1.4.2014) Sauerstoffmangel: Todeszonen in der Ostsee haben sich verzehnfacht (1.5 mal grösser als die Schweiz) <http://tinyurl.com/ndv2tbf>
- (2.4.2014) "Die direkte Demokratie kann Gefahren bergen, wenn die Bürger über hochkomplexe Themen abstimmen", sagte Gauck  
<http://www.tagesanzeiger.ch/schweiz/Gauck-warnt-vor-der-direkten-Demokratie/story/25651167>  
Wenn Politiker über hochkomplexe Themen reden, der neue Ministerpräsident: M. Valls: parlamentarische Demokratie in Frankreich (vor und nach den Wahlen):  
2011: "Il faudra s'en tenir à une règle claire : la durée de vie maximale des centrales nucléaires devra être limitée à trente-cinq ans."  
heute:  
"Evidemment, le nucléaire est une filière d'avenir"  
<http://tinyurl.com/qgzbodg>
- (3.4.2014) "China introduces measures to boost economic growth"  
<http://www.bbc.com/news/business-26863385>

## Summary:

### BAU = Continuing as in the past is impossible!

Infinite economic growth on a finite planet is impossible! **The scientific question is: For how longer can we continue with the local/global BAU scenario?**

Some Suisse “Bundesräte” and politicians seems to accept this and demand a **“Green Economy”** (more on May 24).

- *“Denn wenn der globale Energie- und Ressourcenverbrauch im gleichen Mass wie bisher ansteigt, benötigen wir im Jahr 2050 das 2,3-fache der Ressourcen unseres Planeten. Diese Reserven haben wir nicht.”*

**Bundesrat Doris Leuthard** (Leichter leben - Die 2000-Watt-Gesellschaft Studie 2010):  
[http://www.novatlantis.ch/fileadmin/downloads/2000watt/LeichterLeben2010\\_d.pdf](http://www.novatlantis.ch/fileadmin/downloads/2000watt/LeichterLeben2010_d.pdf)

- *“Global gesehen sind wir weit davon entfernt, die Klimaziele zu erreichen. Je länger wir reden statt zu handeln, desto grösser wird die Wahrscheinlichkeit, dass wir diese Ziele ganz verfehlen. Gleichzeitig sterben Tier- und Pflanzenarten aus. Weltweit bleibt der Energiehunger enorm. **Wir verschwenden Ressourcen, die den nächsten Generationen fehlen werden.**”*

**D. Leuthard (2012)** (<http://www.hossli.com/articles/2012/06/10/samba-fur-eine-bessere-welt/>)

**Why are we in Switzerland still continuing as before?**

Perhaps Einstein (again) described the problem best:

**“Not everything that counts can be counted, and not everything that can be counted counts.”** (Sign hanging in Einstein’s office at Princeton)