

Block I: What is unsustainable today (1)

Global population (time) and population dynamics

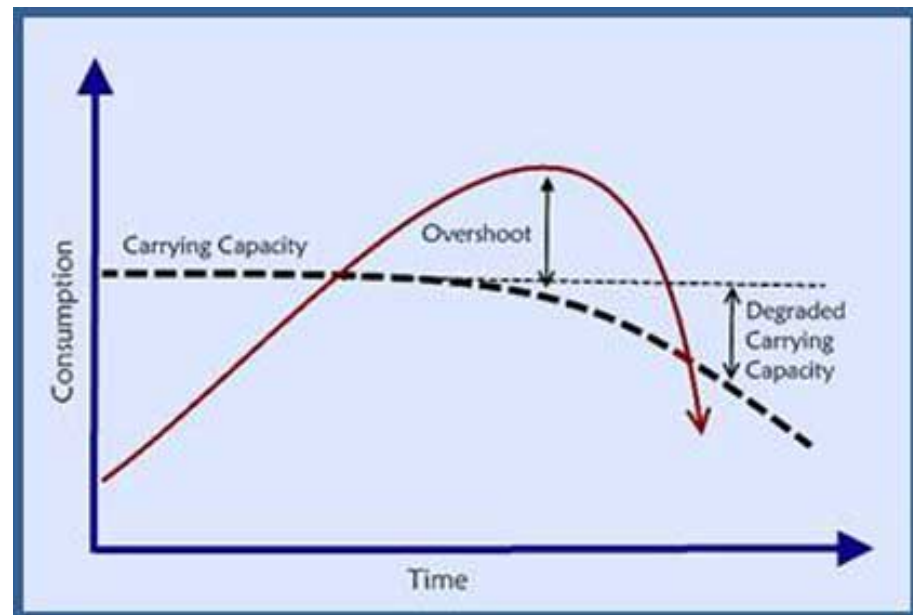
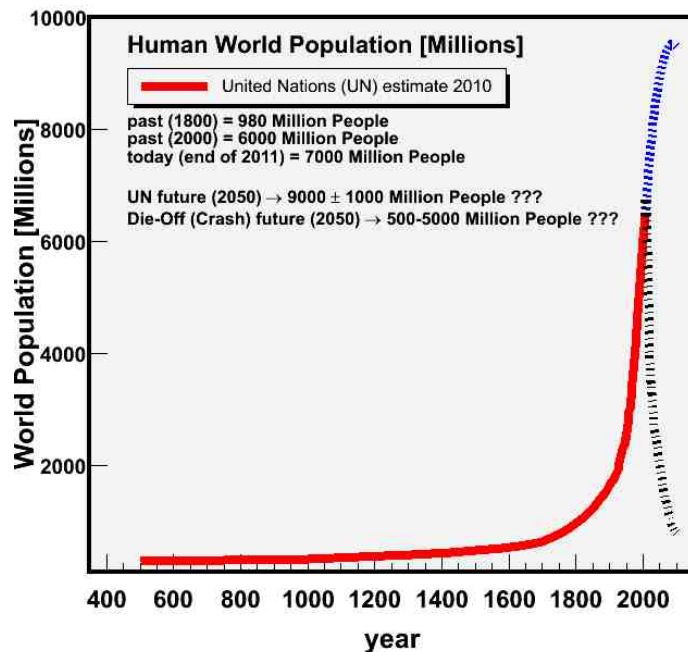
- **Overview and Keywords:**
Population growth, cities and Megacities and the view of the United Nations
- **Basics from biology: Population(time), population dynamics, Carrying Capacity, Ghost-Carrying Capacity, Overshoot and Dieoff.**
- **Impact(Zeit) = Population(t) x Affluence(t) x Technology(t) (I=PAT)**
- **local and global Carrying Capacity?**
- **Summary: “I do not know the answer, but I do know that we need to talk about the population problem”**
Richard Leakey in “Call of Life, facing the mass extinction”

Growth of the global population and Overshoot?

Global population (February 2015): 7.3 billion humans,
annual growth about 1.1% (or about 80 million more humans/year).
Predictions (UNO): 7.8 billions (2020) and about 9 billions (2030!)

If the “average” human today requires more resources than produced sustainable, it follows that “we” are not living sustainable. Future growth (and even a consumption plateau) leads directly to the global system collapse.

<http://www.worldometers.info/world-population/>, http://en.wikipedia.org/wiki/World_population
and <http://www.countercurrents.org/chefurka201109.htm>



the UNO, Switzerland and Population Dynamics

After the failed “millenium” goals:

(see for example: http://www.unep.org/geo/pdfs/geo5/GE05_report_full_en.pdf)

a new and even better program for the years after 2015:

See “Global Consultation in der Post-2015 UN Development Agenda”

<http://www.worldwewant2015.org/>

“The world we want” <http://www.youtube.com/watch?v=3veECxpizP8>

among other topics: Population Dynamics (under Suisse coordination)

<http://www.worldwewant2015.org/population>

and for example “Why rapid population growth is a problem”

<http://www.worldwewant2015.org/node/301842>.

see also World fertility Report 2013 at <http://www.un.org/en/development/desa/population/publications/fertility/world-fertility-2013.shtml> and especially pages 47.. and 42 ..

Ambassador Paul Seger, 22.1.2013

Permanent Representative of Switzerland to the UN in New York

The Government of Switzerland has taken the lead in the Global Thematic Consultation on Population Dynamics. We are of the opinion that this critical theme of Population Dynamics in the context of the Post-2015 discussions needs to be addressed with a broad perspective. We agree with our UN colleagues that population dynamics will critically influence on each of the three main pillars of development – social, economic and environmental – and its consideration is central to any future development agenda. It touches on a complex range of topics that include 4 main sub-themes: population growth, urbanization, ageing, and migration.

Overview: modern(?) humans today

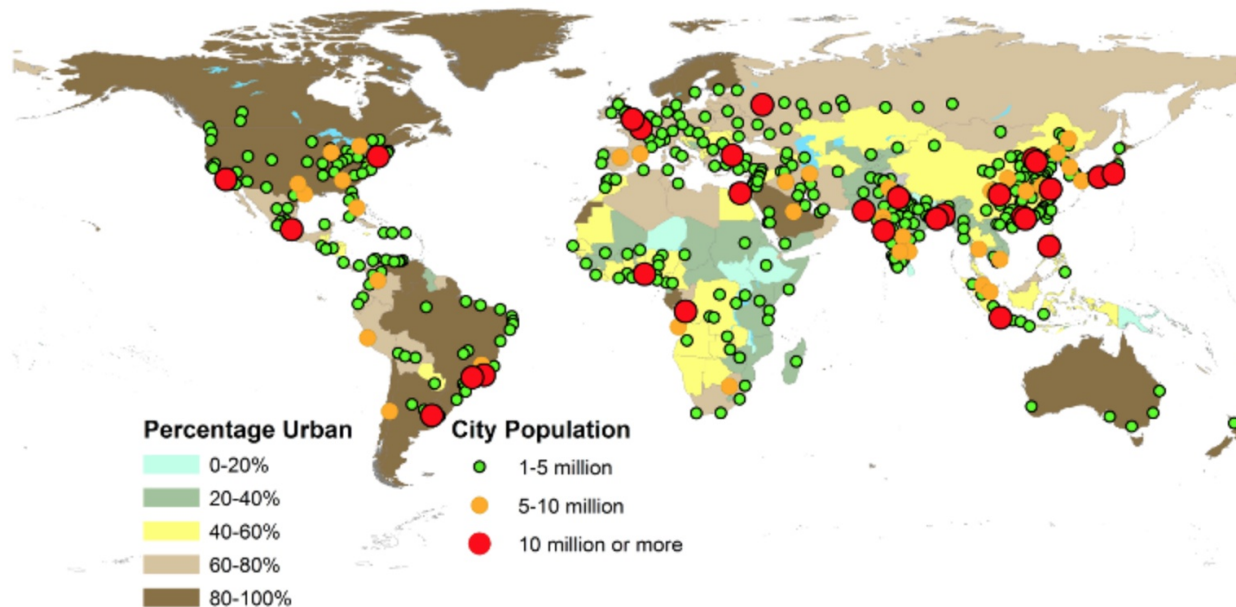
Quote: “That cause, in the case of the Sixth Extinction, is ourselves *Homo sapiens*. This means we can continue on the path to our own extinction, or, preferably, we modify our behavior toward the global ecosystem of which we are still very much a part.” “*Homo sapiens* became the first species to stop living inside local ecosystems. All other species, including our ancestral hominid ancestors, all pre-agricultural humans, and remnant hunter-gatherer societies still extant exist as semi-isolated populations playing specific roles (i.e., have niches) in local ecosystems. This is not so with post-agricultural revolution humans, who in effect have stepped outside local ecosystems(is it true??).”

Text from <http://www.actionbioscience.org/evolution/eldredge2.html>

Percentage urban and urban agglomerations by size class

1970 1990 2014 2030

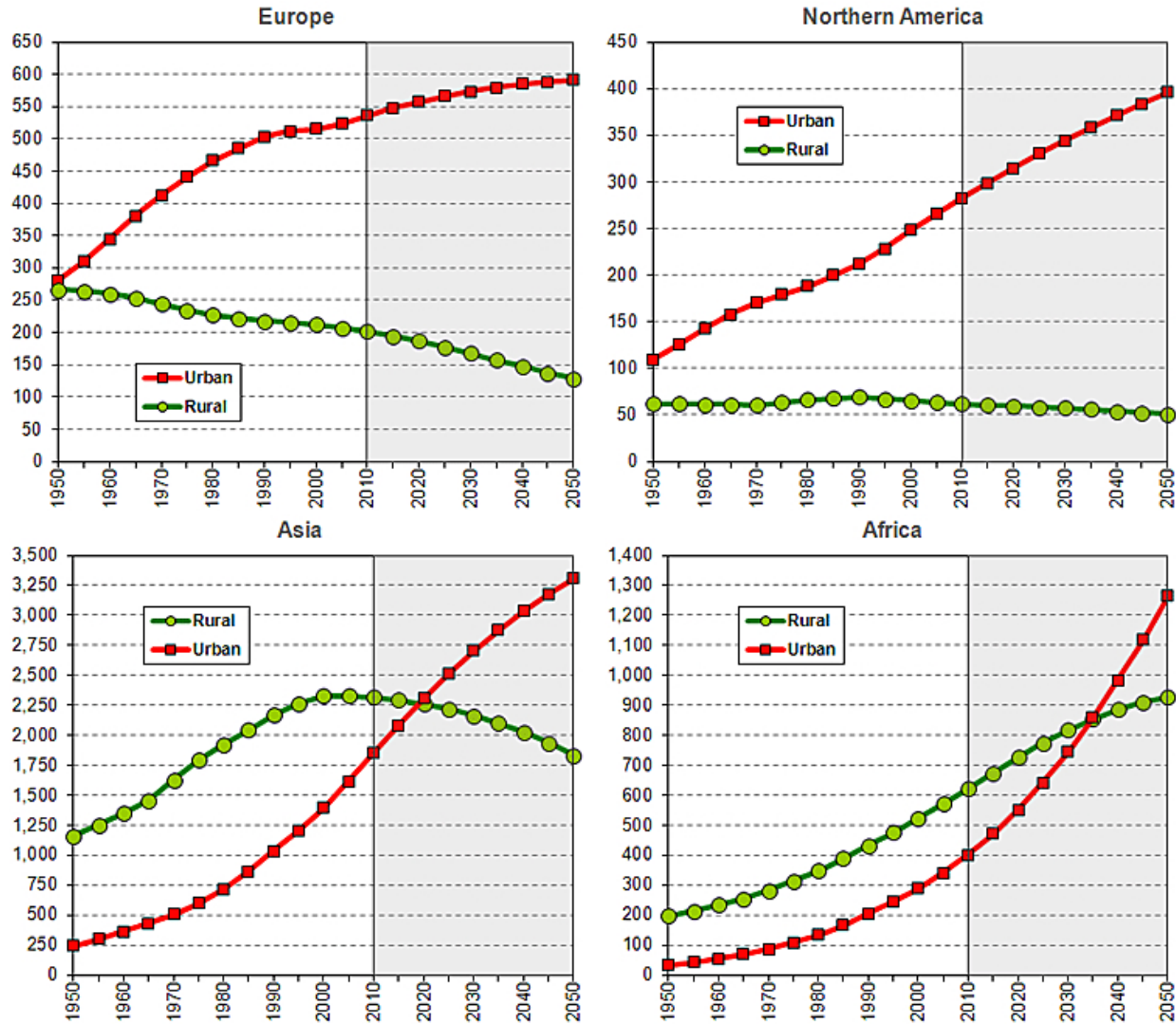
(click on the image to open a full version of the map, in PDF)



Note: Designations employed and the presentation of material on this map do not imply the expression of any opinion whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

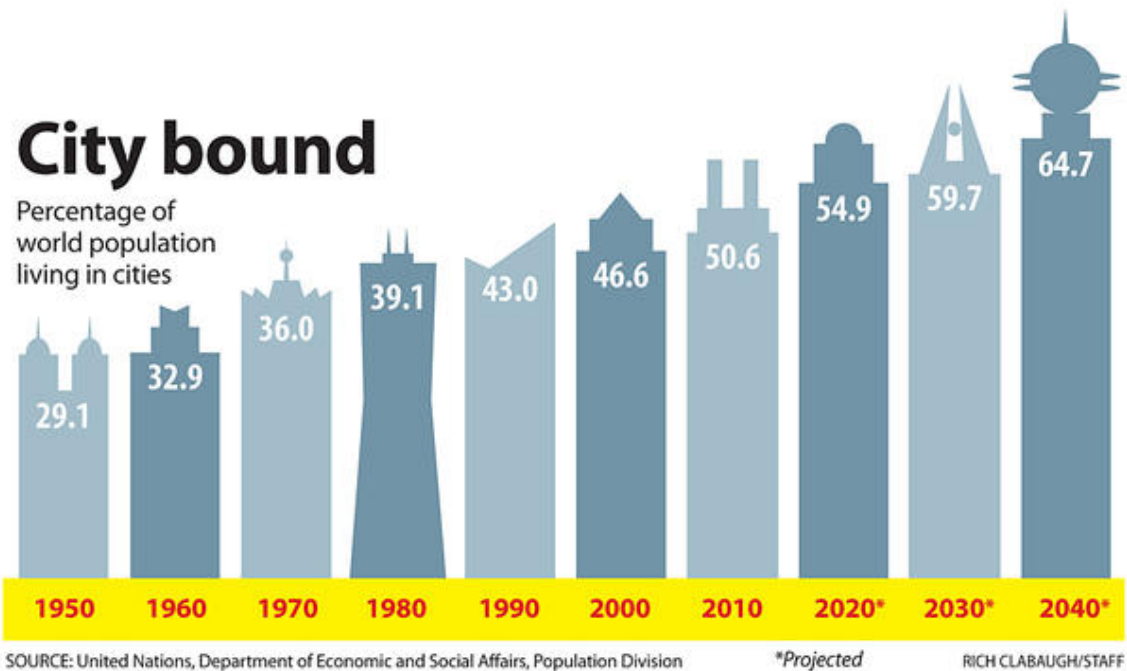
Source <http://esa.un.org/unpd/wup/Maps/CityDistribution/CityPopulation/CityPop.aspx>

Our future: Rural or Urban?



Source: http://esa.un.org/wpp/unpp/panel_population.htm
 original version of plots was http://esa.un.org/unpd/wup/Analytical-Figures/Fig_6.htm

Overview: the Mega Cities(1)



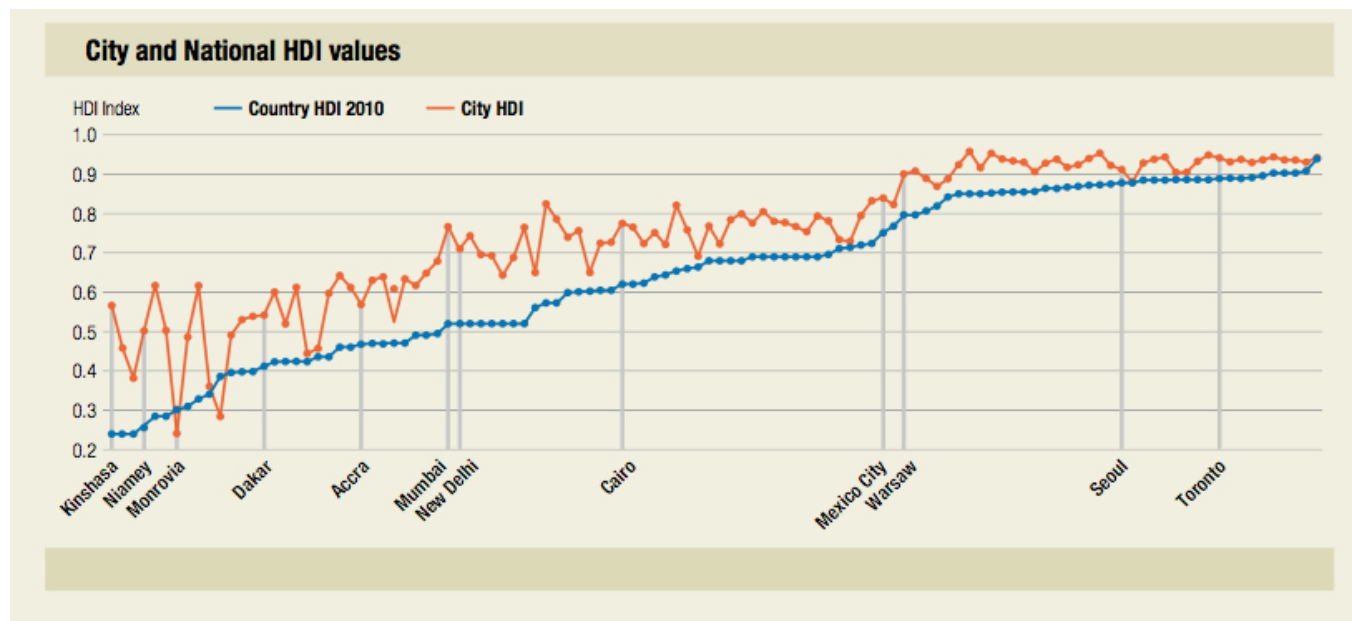
Overview: the Mega Cities(2) (1990-2010)

HDI (human development index) and Mega Cities?

the growth of the Urban Slum Population:

Developing Regions: 650 Millionen (1990) → 862 Millionen (2012)

Sub-Saharan Africa: 102 Millionen (1990) → 213 Millionen (2012)



Plot from (the Slum numbers are from the “small print” appendix, table 2 and 3)

<http://www.un.int/wcm/webdav/site/portal/shared/iseek/documents/2012/November/UNhabitat%20201213.pdf>

Overview: the Mega Cities(3) (2010-2025?) are the UN expectations even possible?

Trailer <https://vimeo.com/24645250> and

<https://www.youtube.com/watch?v=uwCABmP3uQ4> (Dhaka min 50)

example Mexiko-City <http://www.youtube.com/watch?v=4nwsj4Q08Go>

Megacity slums <http://www.youtube.com/watch?v=xoo4YKqwFbM>

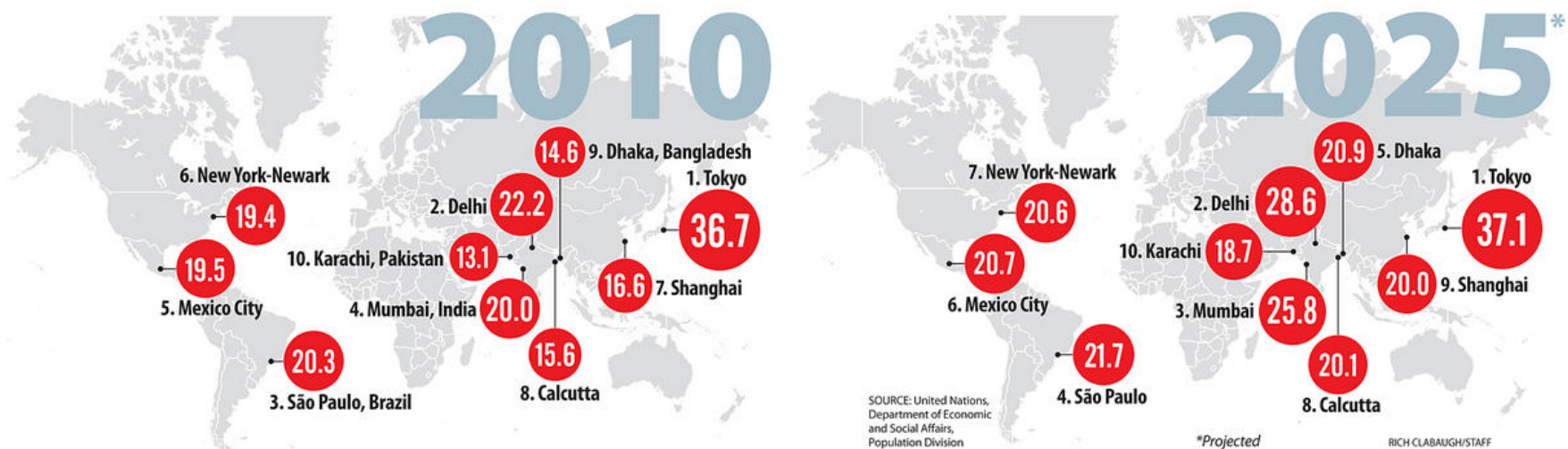
Air pollution in China <http://tinyurl.com/l7ep2cr>

Delhi 22.2 Mill. (2010) → 28.6 Mill (2025)

Dhaka 14.6 Mill. (2010) → 20.9 Mill (2025)

Africa: Cairo 7.8 → 13.5 Mill.; Lagos 7.9 → 15.8 Mill; Kinshasa 5.5 → 15.0;

<http://www.un.int/wcm/webdav/site/portal/shared/iseek/documents/2012/November/UNhabitat%20201213.pdf>



Overview: Mega Cities with little energy/capita

Not really “The World We Want”!

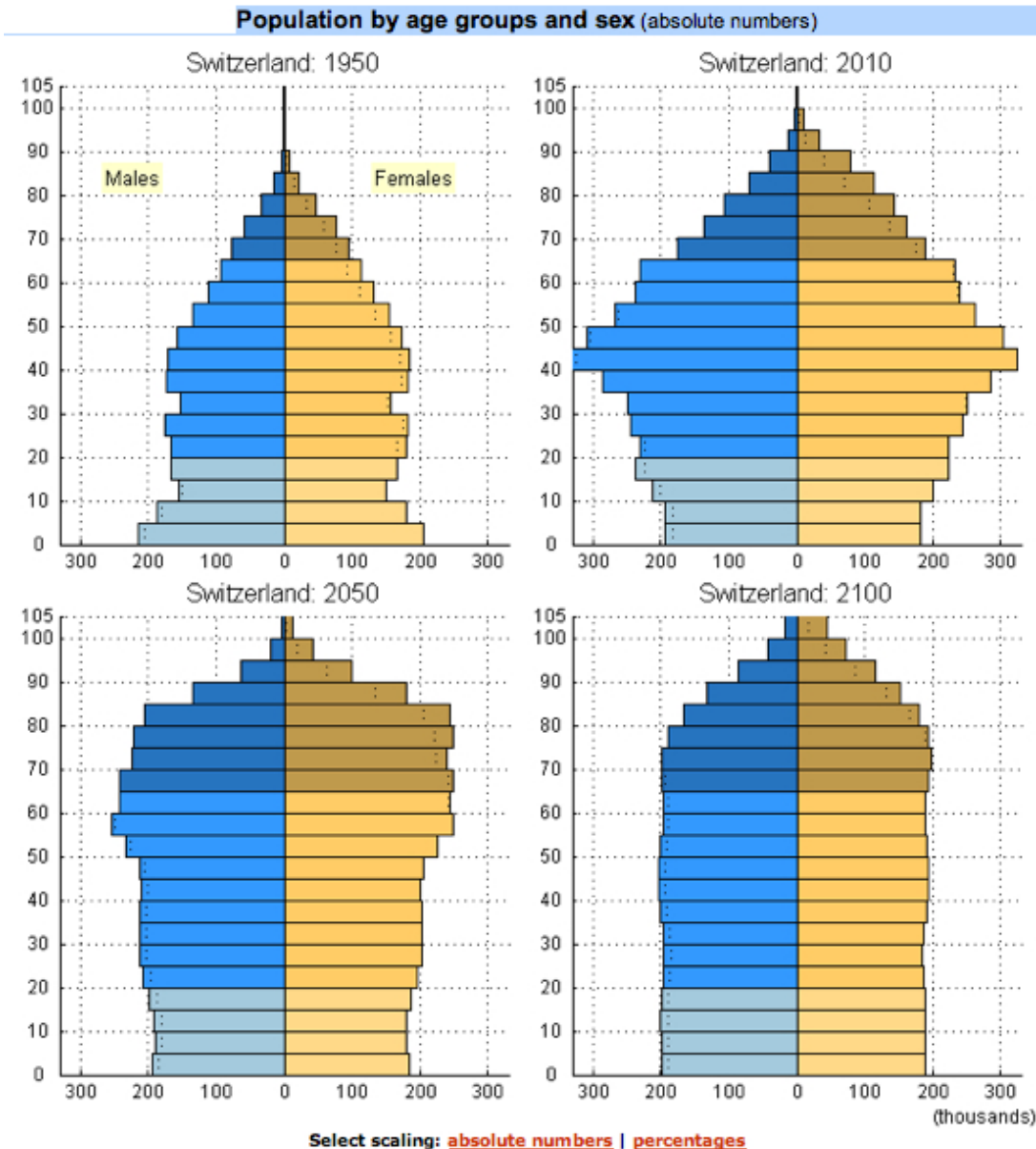


Overview: the Population of Switzerland (1a)

How the Suisse age pyramid will change (according to UN demographers)

BFS <http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/03/blank/key/intro.html>

UNO <http://esa.un.org/unpd/wpp/Demographic-Profiles/pdfs/756.pdf>

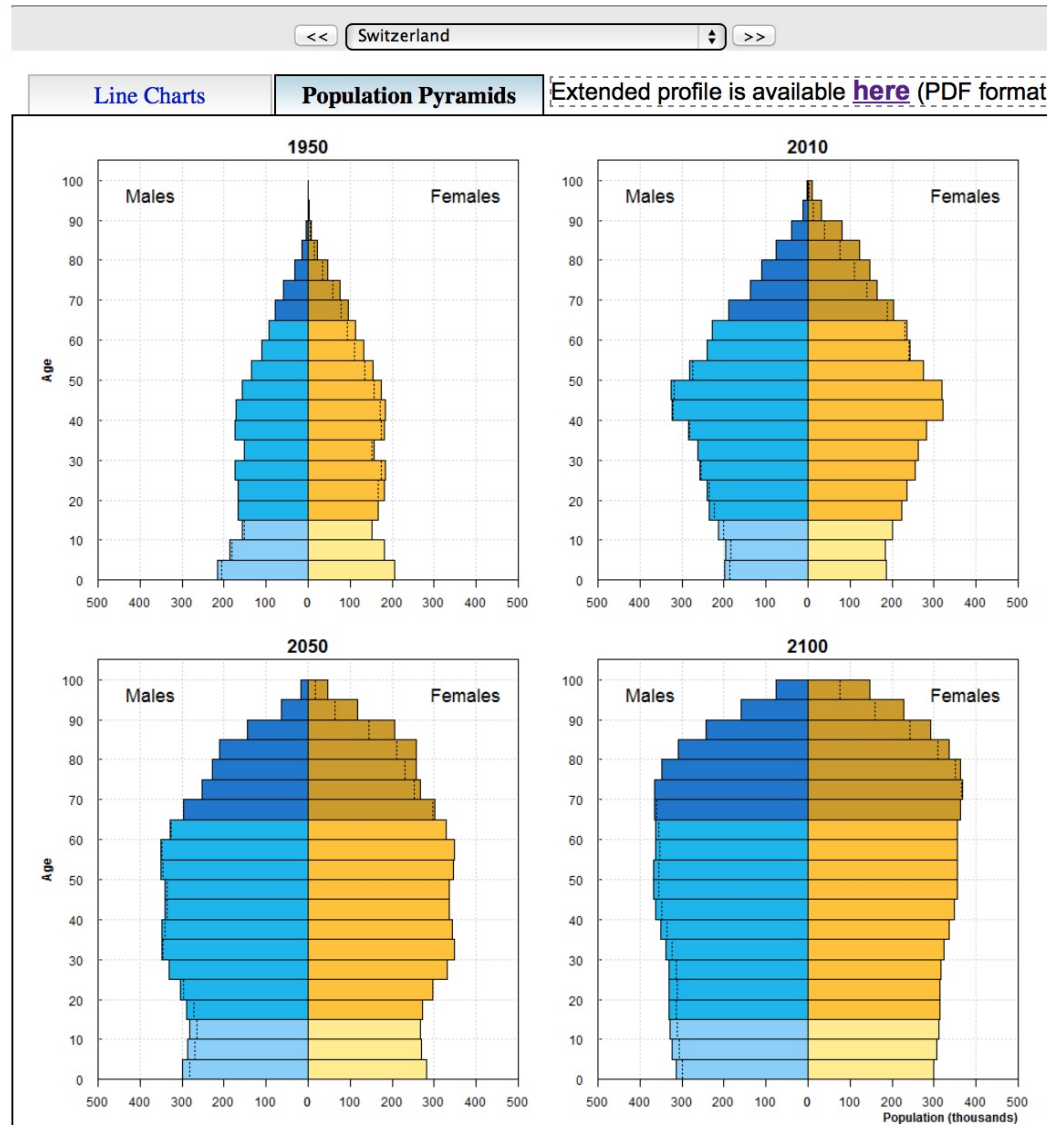


Overview: the Population of Switzerland (1b)

the latest UNO 2012 revision plots present a "different" age structure change in Switzerland

<http://esa.un.org/unpd/wpp/Demographic-Profiles/index.shtm#> und

<http://esa.un.org/unpd/wpp/Demographic-Profiles/pdfs/756.pdf>

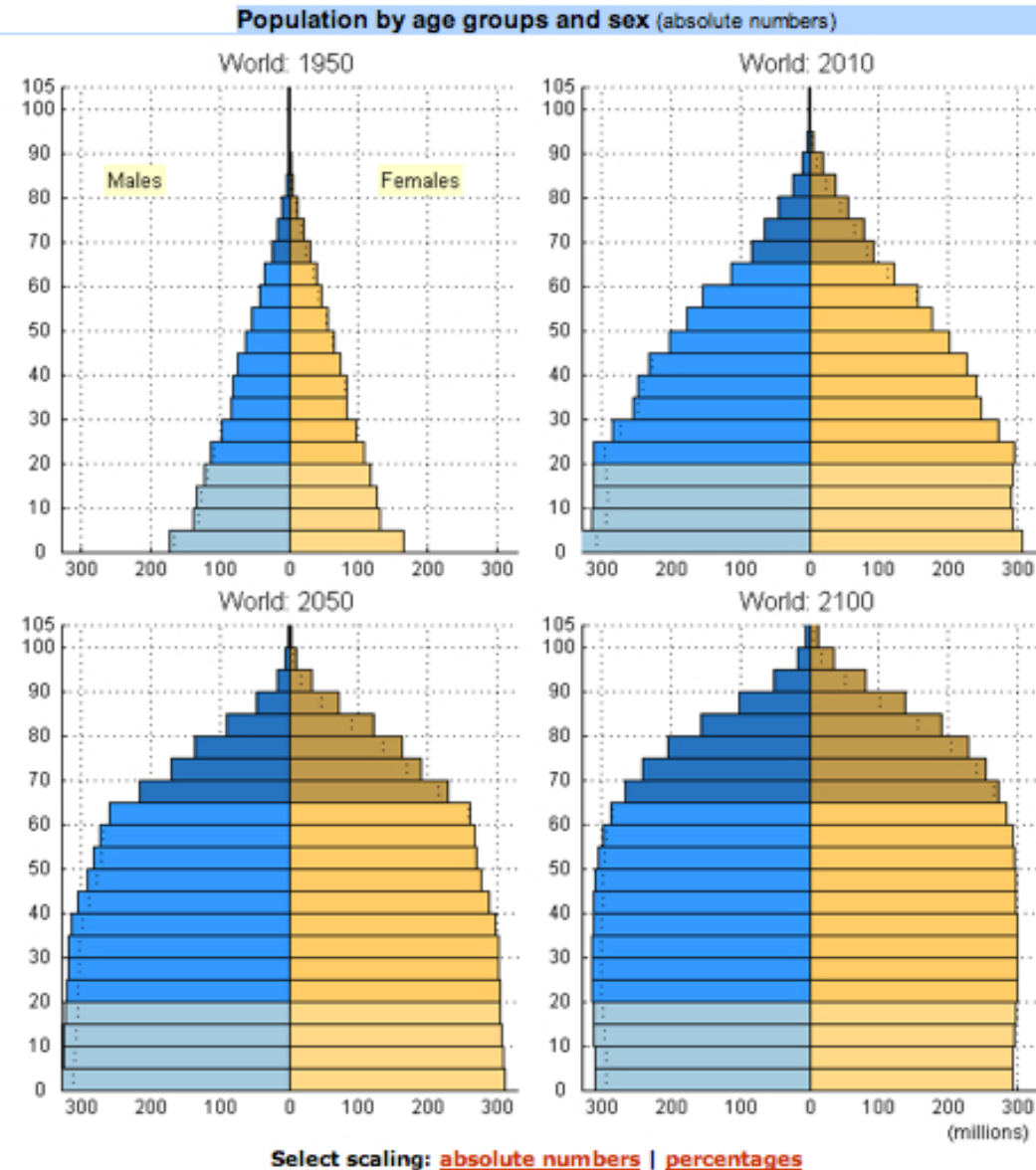


Source: United Nations, Department of Economic and Social Affairs, Population Division (2013). World Population Prospects: The 2012 Revision, Volume II, Demographic Profiles (ST/ESA/SER.A/345)

Overview: the global population (1)

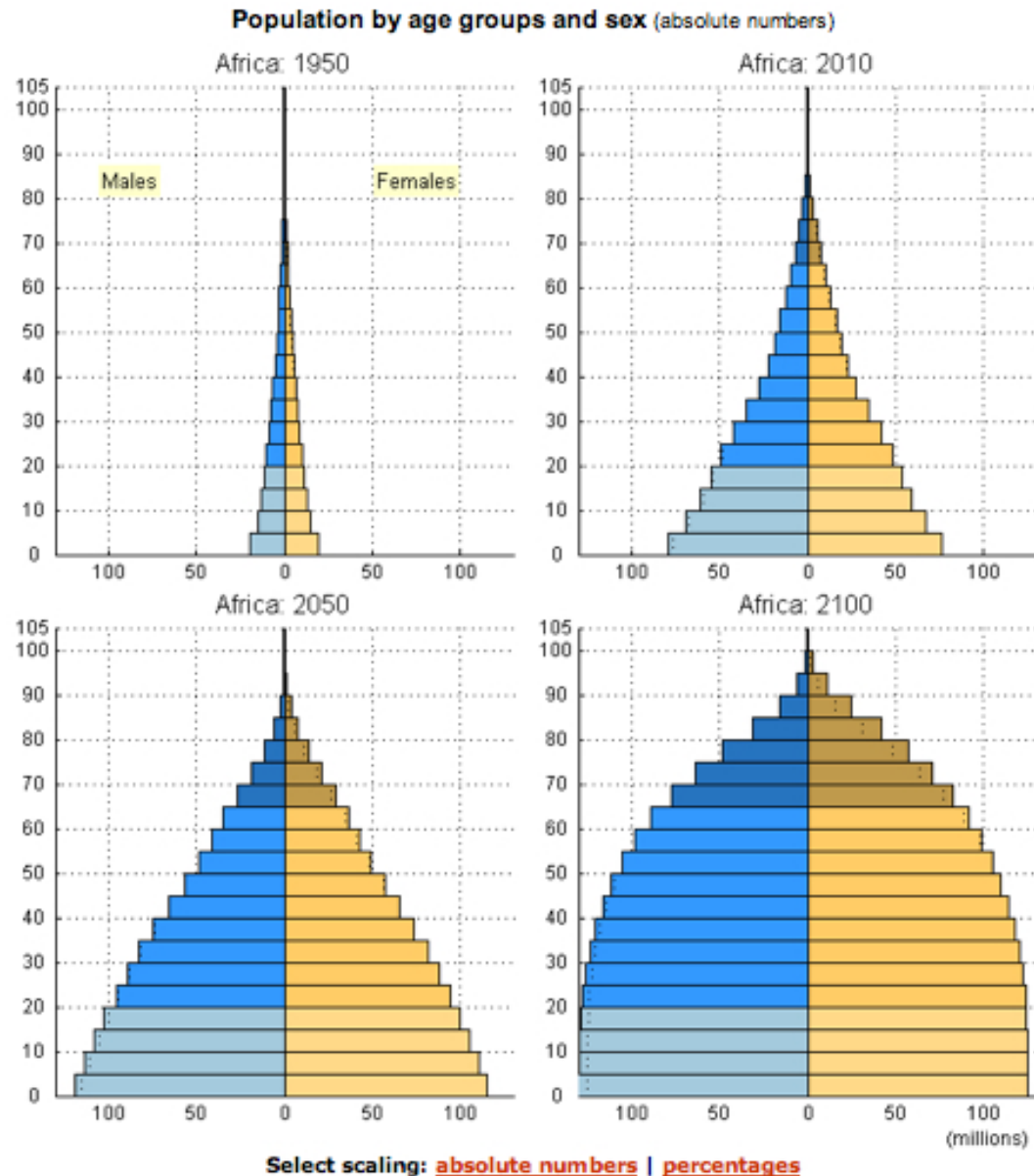
age pyramid changes for the “world population” (UN demographers) and more UN numbers at <http://populationpyramid.net>

Even with 2.1 children/woman (“replacement” birth rate) and no catastrophes, the global population will grow further to about 11 billion by 2100.



Overview: the population in Africa(1)

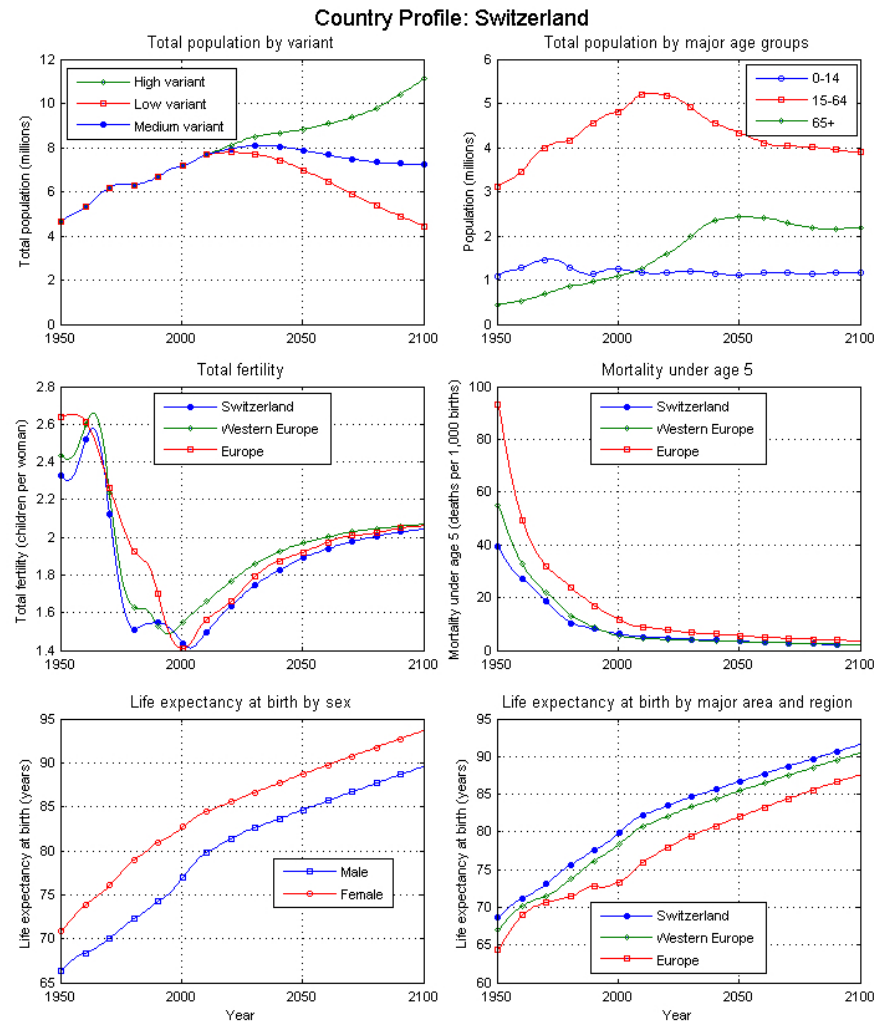
age pyramid changes in Africa (UN demographers) “without” catastrophes
african population will grow from 1 billion to 3.5 billion people by 2100!
more numbers at <http://populationpyramid.net/africa/>



Overview: the Population of Switzerland (2) according to the UN demographers

drastic differences for the "fertility rate(time)" between UN and Suisse demographers
Do Suisse women really want to have more children than today?

http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/03/blank/key/ent_erw.html



<http://esa.un.org/unpd/wpp/Demographic-Profiles/index.shtm>

Overview: the Population of Switzerland (3)

End of 2013 = 8.139 million people (growth about 100 000/year)
end of September 2014 = 8.21 Million people the future population in Switzerland and more numbers at

http://www.bfs.admin.ch/bfs/portal/de/index/themen/01/03/blank/key/ent_erw.html

Schweiz Szenarien

Bevölkerungsentwicklung

Ständige Wohnbevölkerung nach den drei Grundszenarien

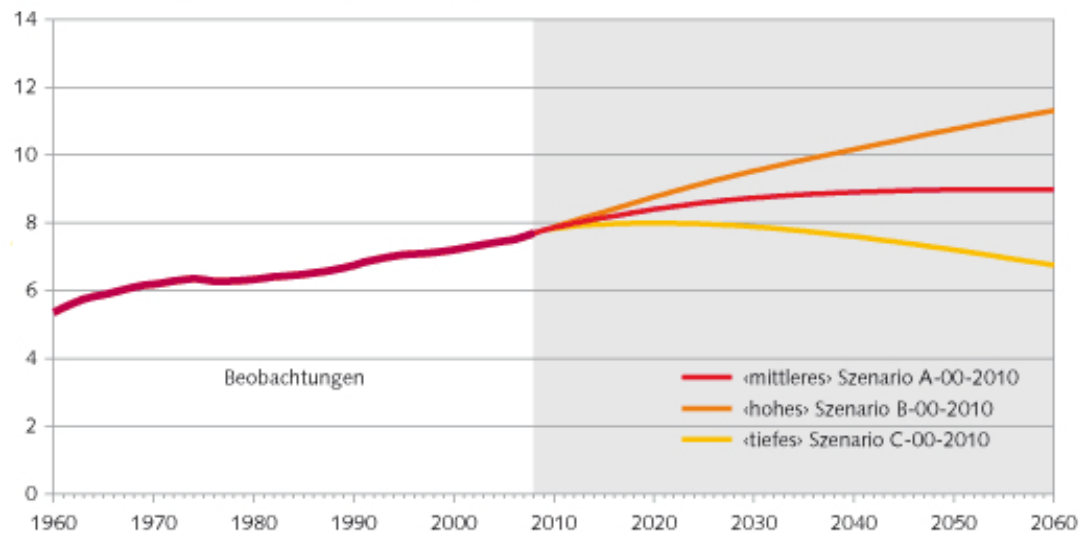
am Jahresende, in Tausend

	2010	2015	2020	2030	2040	2050	2060
«Mittleres» Szenario	7856.6	8155.1	8401.9	8738.5	8906.5	8983.0	8987.2
«Hohes» Szenario	7878.5	8329.2	8765.5	9533.0	10'167.9	10'769.0	11'315.4
«Tiefes» Szenario	7833.1	7958.6	7996.1	7888.3	7599.4	7203.2	6758.2

Quelle: SCENARIO

Entwicklung der ständigen Wohnbevölkerung

Nach den 3 Grundszenarien am Jahresende, in Millionen



Quelle: SCENARIO

© BFS

Overview: the global population (2)

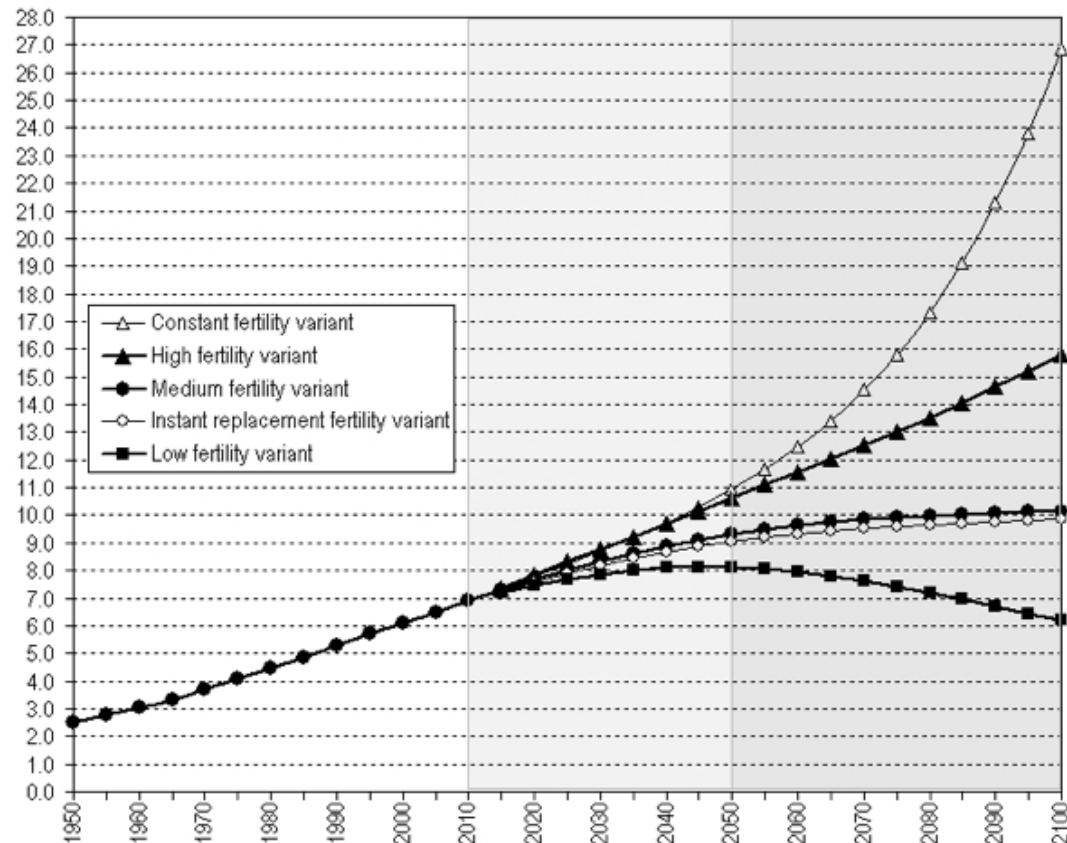
growth scenarios as seen by UN demographers

<http://www.un.org/esa/population/>

<http://esa.un.org/unpd/wpp/index.htm>

World Population Prospects, the 2010 Revision

Figure 1: Estimated and projected world population according to different variants, 1950-2100 (billions)



Source: United Nations, Department of Economic and Social Affairs, Population Division (2011): World Population Prospects: The 2010 Revision. New York
(Updated: 15 April 2011)

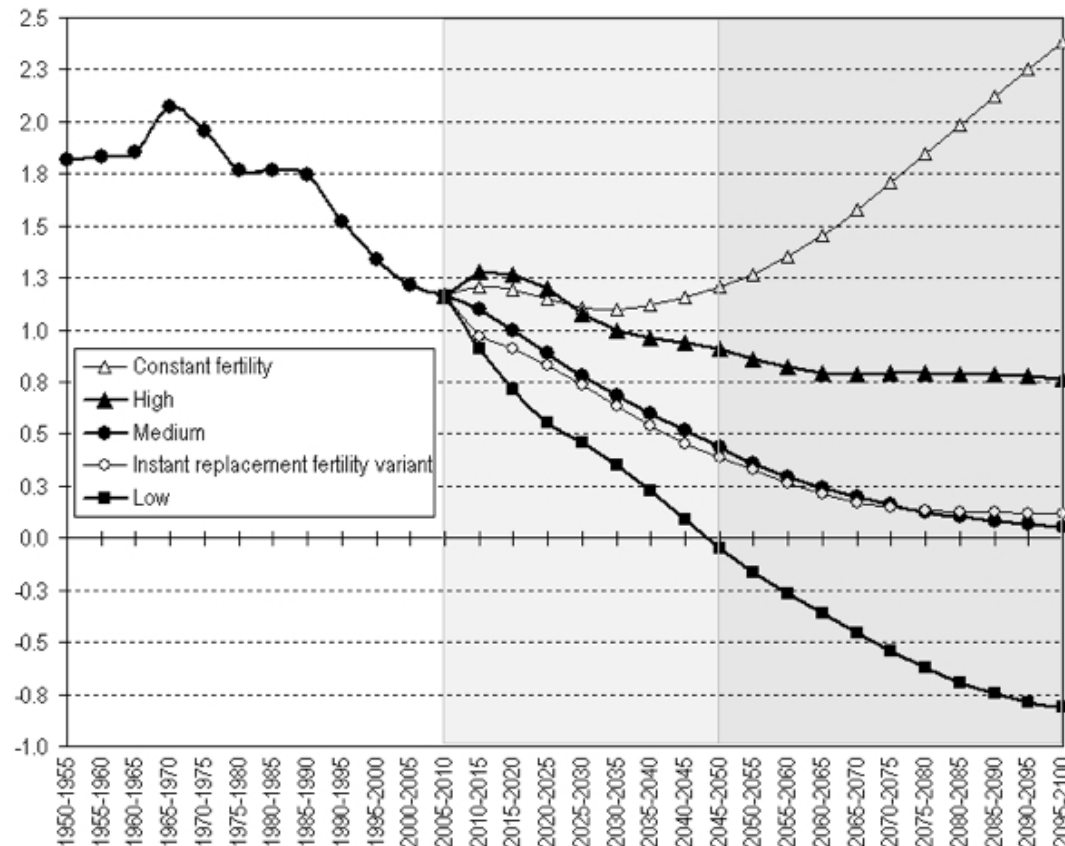
figure and more http://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2011-2.pdf

Overview: the global population (3)

growth scenario depends on fertility rate (time) and life expectancy (growing?)

World Population Prospects, the 2010 Revision

Figure 6: Average annual rate of change of the world population by projection variant (percentage)



Source: United Nations, Department of Economic and Social Affairs, Population Division (2011): World Population Prospects: The 2010 Revision. New York
(Updated: 15 April 2011)

Figure and more at http://www.un.org/en/development/desa/population/publications/pdf/popfacts/PopFacts_2011-2.pdf

Population as a function of time; Population dynamics (biological basics)(1)

population dynamics http://en.wikipedia.org/wiki/Population_dynamics
(or in german <http://de.wikipedia.org/wiki/Populationsdynamik>
(and population ecology http://en.wikipedia.org/wiki/Population_ecology)

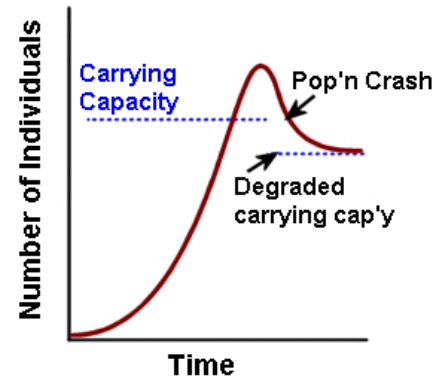
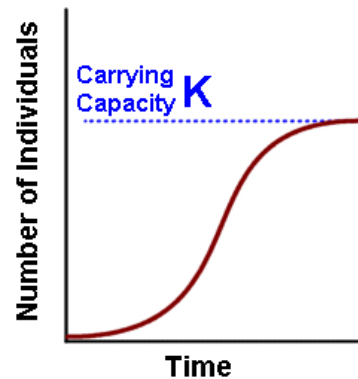
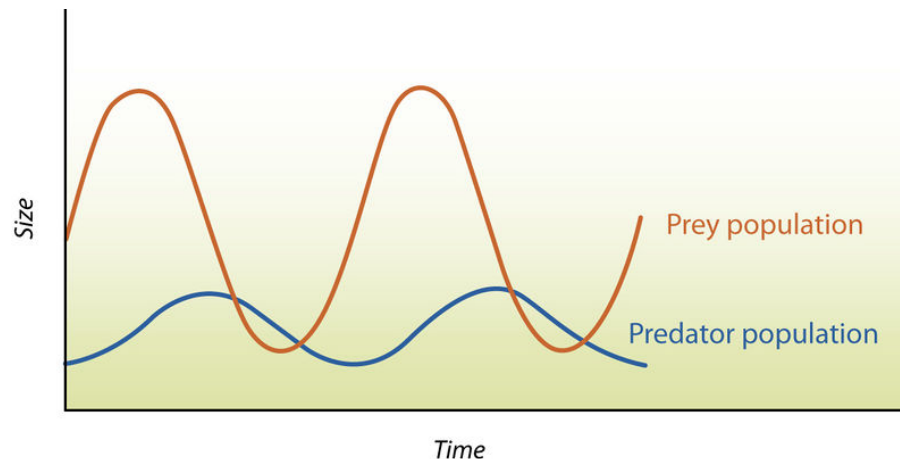
quote: *“Population dynamics is the branch of life sciences that studies short-term and long-term changes in the size and age composition of populations, and the biological and environmental processes influencing those changes. Population dynamics deals with the way populations are affected by birth and death rates, and by immigration and emigration, and studies topics such as ageing populations or population decline.”*

- **birthrate (time)**: depends on fertility rate, food supply and area (size).
- **death rate (time)**: “enemies”, sickness and age
- **carrying capacity**: limited living space (space and resources)
- **Minimum viable population**:
minimal population size (90-95% probability) to guarantee a survival between 100-1000 years.
- **Maximum sustainable yield (MSY)**: theoretical yield (catch) (the largest yield) which can be taken sustainable from one species.
(more on March 20: Biodiversity and sustainability)

Population as a function of time; Population dynamics (biological basics)(2)

Population dynamics and population ecology

$$\text{Pop}(t) = P(0) + (\text{birth rate}(t) + \text{immigration}(t)) - (\text{death rate} + \text{emigration}(t))$$



St Matthew Island Reindeer: http://www.youtube.com/watch?v=gS-jZp_cvqY

Impact = Population x Affluence x Technology (1)

the I=PAT equation: http://en.wikipedia.org/wiki/I_%3D_PAT

P.R. Ehrlich, J.P. Holdren, *Impact of population growth*, Science, 1971

“Human Impact (I) on the environment equals the product of P= Population, A= Affluence, T= Technology. This describes how our growing population, affluence, and technology contribute toward our environmental impact.”

- **Impact:** user “environmental impact”
- **Population:** “Since the rise of industrial societies, human population has been increasing exponentially.”
- **Affluence:** “average consumption of each person in the population. As the consumption of each person increases, the total environmental impact increases as well.”
- **Technology:** “how resources are used to produce our affluence. (Increases in efficiency can reduce overall environmental impact. However, with P increasing exponentially, T would have to decrease drastically (doubling efficiency each time the population doubles))”

If, on average, we use more natural capital (Impact) than is regenerated, then we violate the local and global sustainability principle!

Is it really possible that the global population can increase from 7.3 billions to 9-10 billions?

Is it really possible that the population in Africa can grow from 1 billion today to 3.5 billions?

(what will happen to the Gorillas, Chimps, Bonobos, Elephants, Lions etc?)

Impact = Population x Affluence x Technology (2)

a new modified and quantifiable I=PAT equation: M.D. 2013!

Without the connection to the remaining Carrying Capacity (CC) (or the natural capital) the use of the I=PAT equations is at best only “qualitativ”!

$$CC(\text{time}) = CC(t=0) - \text{Impact}(t) + \text{Restauration}(t)$$

Impact (t) = natural reduction (like volcano eruptions) + I(=PAT (human))

Restauration(t) = nat. Rest. (e.g. tree growth) + Rest. (Human help!)

Using the natural capital faster than its regeneration violates the local and global sustainability principle!

(Attention: the Ghost carrying capacity (“thanks” to non renewable resources) today is huge)

Switzerland: Without oil and electric energy almost nothing functions today.

Overshoot = the Suisse “footprint” (impact) is about 4 times larger than the Suisse natural restoration. Adding the Ghost Carrying capacity impact (imagine to replace oil with timber): the overshoot is at least 40 times larger.

We need to quantify the situation with the remaining resources!

(Lecture 6.3.2015)

Overshoot, global and locale sustainability (1) (some unhappy thoughts)

actual carrying capacity(t) = carrying capacity(t) + ghost-carrying capacity(t)

if we are using more than our regular income we are not living sustainable!

we have exceeded the global “carrying capacity”!

- No unique method to estimate the “carrying capacity” of planet earth!
0.1 billions?, 1 billion(?) or 5 billions(?) humans
- Before using fossile fuels: human population was less than 1 billion
(and only rarely(?) they lived “sustainable”)
- According to the “EcoFootprint” concept we are using about 1.4 Planets annually: the Earth has space for about 5 billions average humans (ignoring the “Ghost carrying capacity”). increasing living standard for everyone (to Suisse/EU average) would increase the impact to 4 planets the planet would provide “space” for 1.75 billion people!.
- the EcoFootprint concept (more on April 24) ignores the Ghost Carrying Capacity and the limited (energy) resources (more on March 6). The carrying capacity is even smaller!
- the Ghost-Carrying Capacity (thanks to fossile energies) will soon decline!

Overshoot, global and locale sustainability (2)

(“happier” thoughts, I want to believe!)

real carrying capacity(t) = carrying capacity (t) + ghost-carrying capacity (t)

(1) For a good life our Impact (**Impact = P x A x T**) does not have to be so large and

(2) (in theory) we could increase the carrying capacity by “repairing” the damage done in the past!

- Many reports and studies indicate that (as long as minimal requirements are fulfilled) **Affluence and quality of life are not correlated!**
- Examples demonstrate that the local (and global) “carrying capacity” can be increased and repaired (“greening the desert”)
<http://www.geofflawton.com/fe/62176-desert-oasis?r=y>
What if we change <http://www.youtube.com/watch?v=6iJKiFSQLn4>
- Humans can be destructive or constructive! We can turn “forests into deserts” or deserts into “Food Forests”.
The “deserts” in Switzerland are relatively small!
- Successful examples of “developments towards sustainability” in a well functioning community give people power, energy and enjoyment in life!
- Suisse mountain adventurers (guides) have in general a fulfilling life!
http://en.wikipedia.org/wiki/Happy_Adventure.

Summary: 27.2.2015

Today's "human" Impact = Population(t) x Affluence (t) x Technology(t)
violates the sustainability principle and the world population still grows by 1%
(80 million humans) per year.

- $Pop(t) = Pop(0) + (birth\ rate(t) + immigration(t)) - (death\ rate(t) + emigration(t))$
- Mega Cities with little energy are Mega-Slums and a human catastrophe.
(Mega Cities have the potential to create a global pandemic (a "pest" of the 21. century)
and we are all in the same boat!)
- Nice speeches and UN documents in contrast to harsh realities in countries like Bangladesh/Nigeria..
<http://www.eda.admin.ch/eda/de/home/travad/hidden/hidde2/bangla.html>
"Meiden Sie grosse Menschenansammlungen und Demonstrationen jeder Art"
- UN demographers propagate "healthy" population growth and ignore poverty, resources depletion, climate change etc
Bangladesh from 150 million (2010) to 190 million (2040)
Nigeria 160 million (2010) to 400 million (2050) and 700 million (2100).

A very interesting article (in German) not only for the exercises March 6., 2015:
http://www.zeit.de/2007/21/Falsche_Propheten