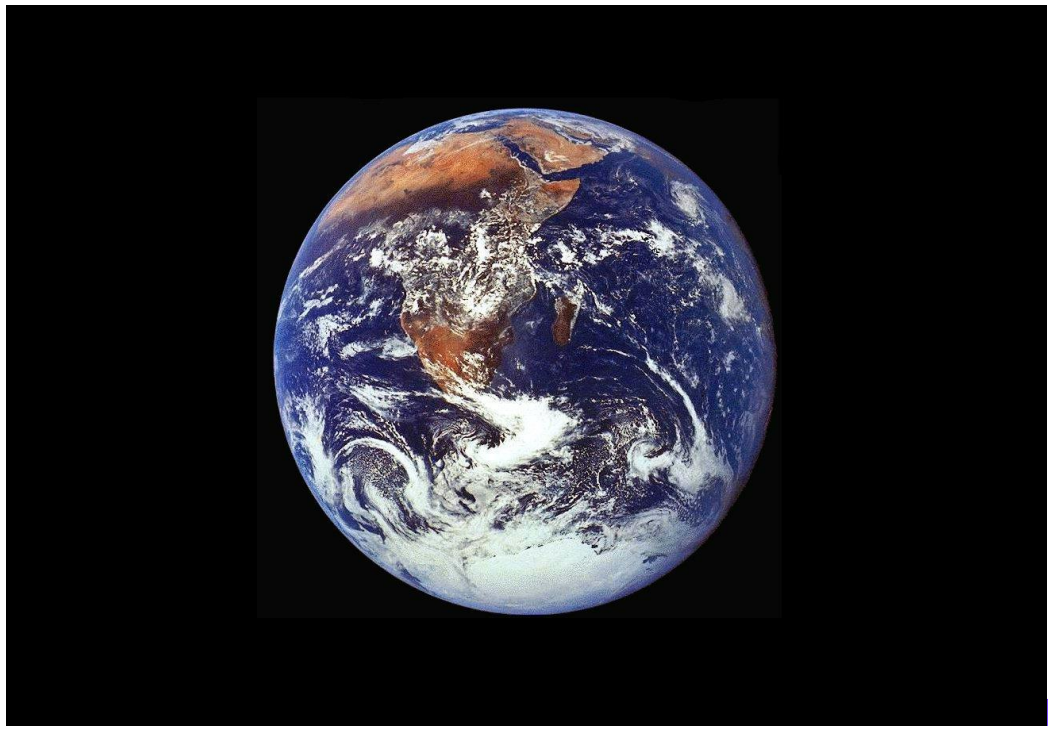
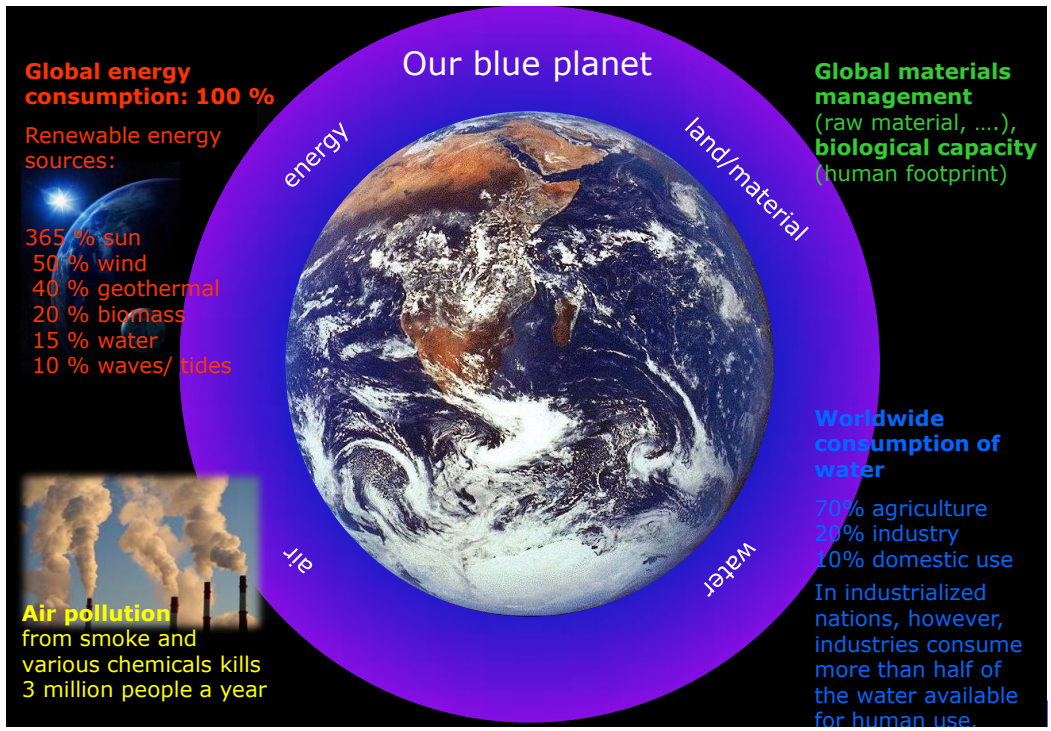



Our blue planet
energy
land/material
water
air
Global energy consumption: 100 %
Renewable energy sources:
365 % sun
50 % wind
40 % geothermal
20 % biomass
15 % water
10 % waves/ tides
Air pollution
from smoke and various chemicals kills 3 million people a year
Global materials management
(raw material, ….),
biological capacity
(human footprint)
Worldwide consumption of water
70% agriculture
20% industry
10% domestic use
In industrialized nations, however, industries consume more than half of the water available for human use.

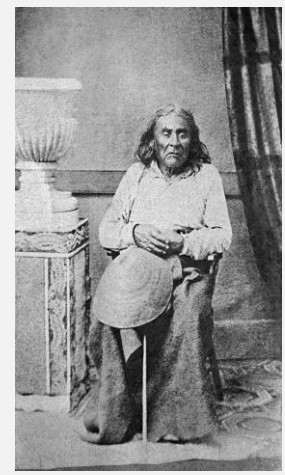
Green Technology
– a chance in our future?

Prof. Dr. Dr. h.c. Alfred Leidig
RMUTP, December 2014

BTACC
Bavarian Thai Academic Cooperation Center

- "We have not inherited the earth from our ancestors.

  We only borrowed it from our children."



(Source: from speech of Indian Chief Seattle, Washington 1854)

- Current situation and the climate change
- Environmental Policy Guidelines
- Advanced Building and Insulation Technology in Germany
- Activities in Future

Eco-Logic:
Investing for the Environment

Climate change is a good reminder that the environment itself is increasingly becoming a scarce resource which has a "price".

To accept these "Eco-Logic" means investing in the environment.

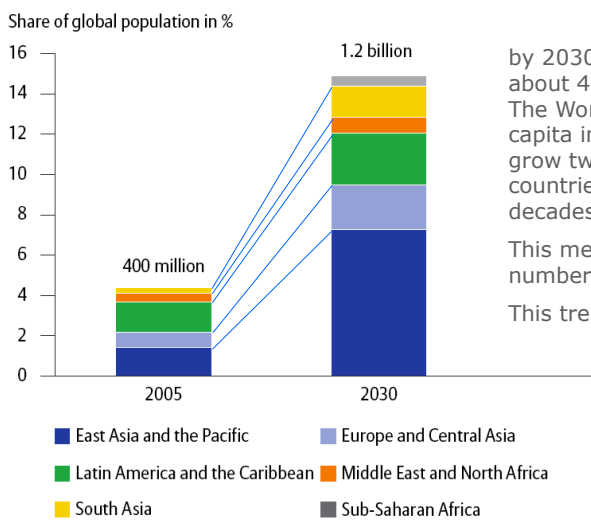
Investing for the Environment

The environment has become an increasingly hot investment theme in the past few years. There are essentially three megatrends behind this:

1. Economic growth and population growth, which increase demand for commodities.
2. The limited supply of commodities, which makes them even scarcer.
3. Climate change, which makes the environment itself a scarce resource.

The global middle class is growing rapidly

Middle-class income is from USD 4,000 – 17,000 per capita (purchasing power parity)



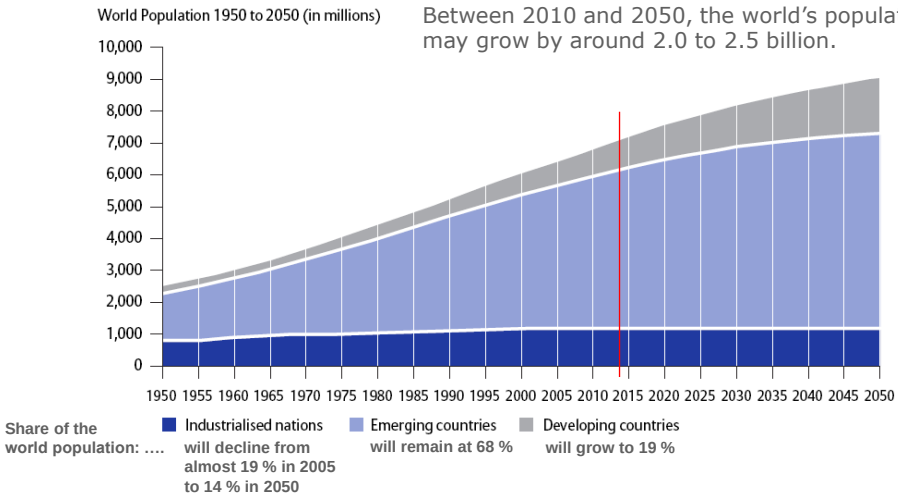
by 2030 China and India will make up about 44 % of the global middle class. The World Bank assumes that real per capita income in low-income countries will grow twice as fast as in high-income countries (OECD countries) in the coming decades.

This means more than just a rising number of consumers.

This trend is also reflected in urbanization.

Source: World Bank, Presentation : Allianz GI Capitla Market Analysis

High growth in emerging markets



Between 2010 and 2050, the world's population may grow by around 2.0 to 2.5 billion.

Share of the world population: ....

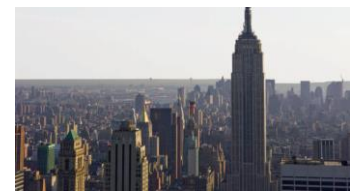
Industrialised nations will decline from almost 19 % in 2005 to 14 % in 2050

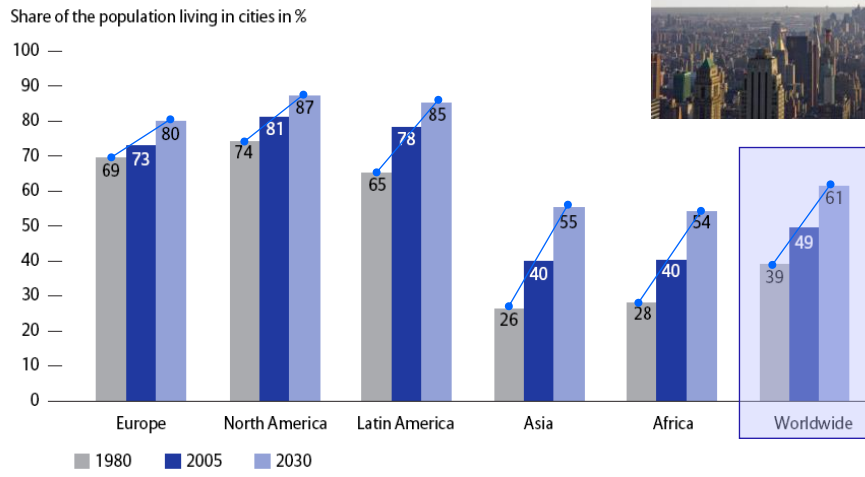
Emerging countries will remain at 68 %

Developing countries will grow to 19 %

Source: UN world Population Prospects, 2009 Revision, Presentation: Allianz Global Investors (GI) Capital Market Analysis

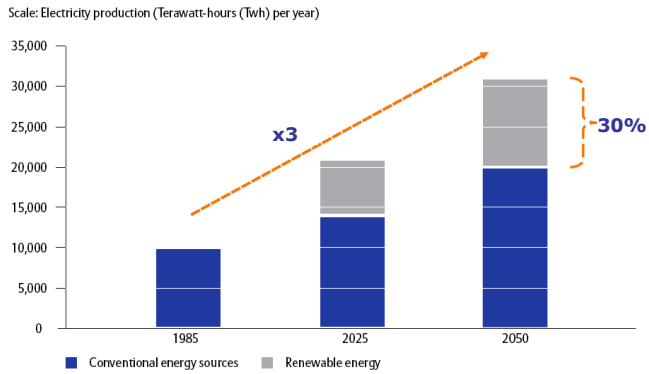
Urbanisation: the future belongs to the city





Source: UN, World Population Prospects, 2005 (middle variant), Presentation: Allianz GI Capital Market Analysis

Sustainable energy consumption with renewable energy



The global demand for energy is rising in step with world population growth, while conventional energy resources such as oil and gas are limited. The International Energy Agency (IEA) estimates that global energy demand will probably increase by 45% by the year 2035.

According to the World Energy Council (WEC), the global share of renewable energy sources is expected to rise from its current level of approximately 7% to about 30% by 2050.

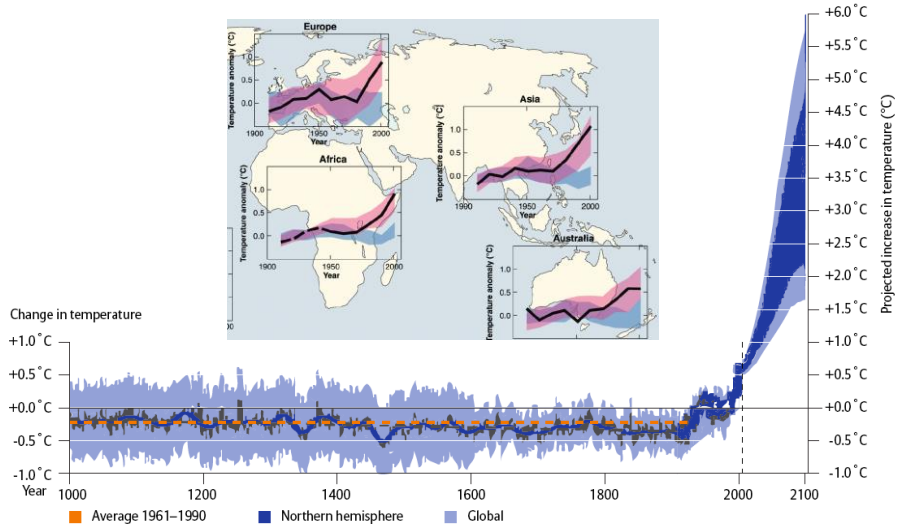
Source: World Energy Council, Presentation: Allianz GI Capital Market Analysis

Climate change: greatest challenge of the future

… the facts are now well known:

- The years 2001 to 2007 were all among the 10 warmest years on record since 1880
- Sea levels rose by 19.5 cm from 1870 to 2004
- Increase in natural desasters
- According to a 2008 study, CO2 emission grew four times faster from 2000 to 2007 than in the previous decade
- Slowdown of glaciers and poles

Sharp rise in temperatures



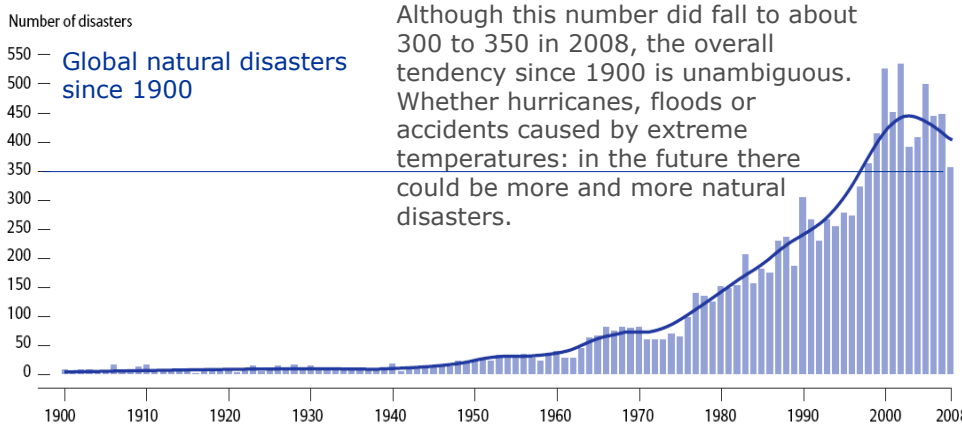
Source: Intergovernmental Panel on Climate Change (IPCC) Working Group 1, Climate Change 2001/2007; Presentation: AllianzGI Capital Market Analysis

Effects of environmental pollution

Extreme weather events like hurricanes and floods have increased disproportionately in recent years.

According to the Centre for Research on the Epidemiology of Disasters (CRED), around the turn of the century there were about 500 to 550 natural disasters per year.

Sharp increase in natural disasters around the world …



Global natural disasters since 1900

Although this number did fall to about 300 to 350 in 2008, the overall tendency since 1900 is unambiguous. Whether hurricanes, floods or accidents caused by extreme temperatures: in the future there could be more and more natural disasters.

Source: Centre for Research on the Epidemiology of Disasters (CRED), Presentation: Allianz GI Capital Market Analysis

Sharp increase in natural disasters around the world …leads to rising costs

Costs (in USD bn) of global natural disasters since 1900

Hurricane Katharina >

Tsunami South East Asia

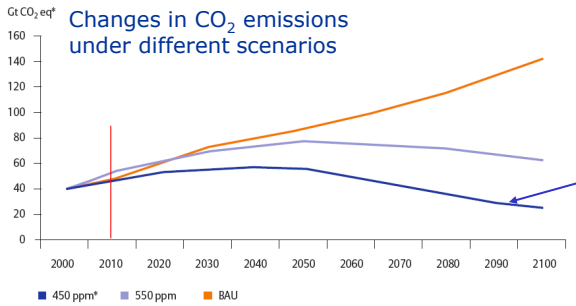
Kobe earthquake >

While costs up to the end of the 1980s were still relatively low, at the turn of the century they peaked at over USD 200 billion per year.

Economy and ecology thus have the same interests: reducing pollution, using renewable energy and making more efficient use of existing resources.

Source: Centre for Research on the Epidemiology of Disasters (CRED), Presentation: Allianz GI Capital Market Analysis

Objective:
Reduction of Greenhouse Gas concentrations



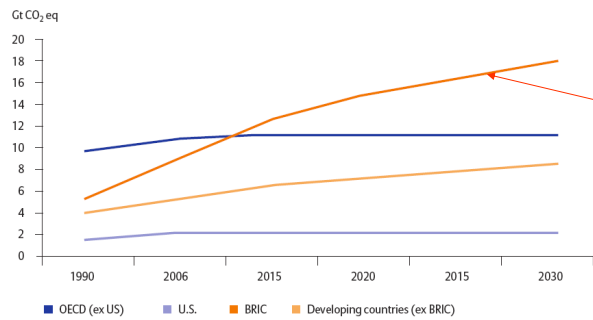
In view of rapidly advancing climate change, the world is working towards the scenario that reduces emissions to 450 ppm.

The range of forecasts depends on future emissions of greenhouse gases, with temperature changes varying depending on the scenario:

- No reduction of greenhouse gases (BAU = business as usual) would mean a concentration of more than 600 ppm and a temperature increase of 3–6° C.
- Moderate reduction of greenhouse gas concentrations to 550 ppm. This corresponds to a maximum rise in temperature of 2–4° C.
- Significant reduction of green-house gas concentrations to 450 ppm.
  This corresponds to a maximum rise in temperature of 1–3° Celsius (°C).

Source: Deloitte, IPCC; Presentation: Allianz GI Capital Market Analysis

Forecasts of CO_2 emissions for various countries



The sharpest increase, however, is seen in the BRIC countries (Brazil, Russia, India and China) and the other developing countries, where emissions of greenhouse gases are expected to nearly double by 2030

177 countries have committed to reducing emissions under the Kyoto Protocol 2.

The objective is to reduce their emissions of greenhouse gases to at least 5 % lower than 1990 levels by 2012.

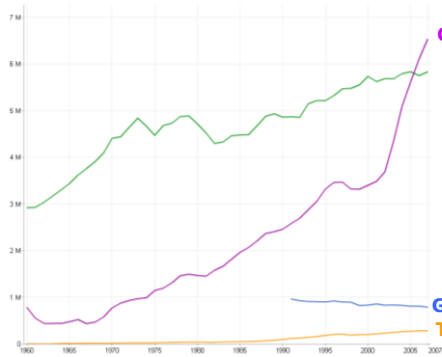
The European Union (EU) wants to go even further, and is aiming for a reduction of 8 %.

The U.S., China, India, South Korea and Australia (which has now ratified the Kyoto Protocol) are also seeking to reduce greenhouse gases.

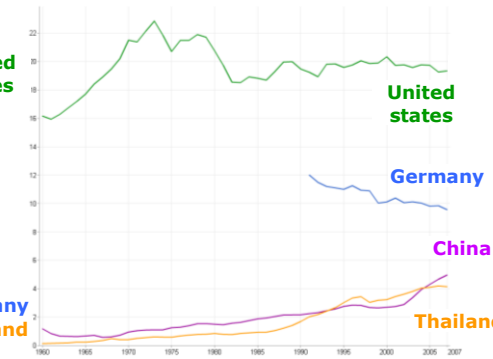
Source: OECD World Economic Outlook; Presentation: Allianz GI Capital Market Analysis

CO_2 emission by comparison

CO_2 emissions (kt)



CO_2 emissions per capita



Carbon dioxide emissions are those stemming from the burning of fossil fuels and the manufacture of cement. They include carbon dioxide produced during consumption of solid, liquid, and gas fuels and gas flaring.

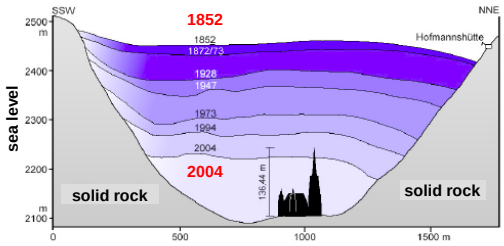
Source: Data from: World Bank, World Develoment Indicators; Last updated: Jul 21, 2011

Slowdown of Glaciers

Altesch Glacier at 1900

Altesch Glacier at 2005

Source: Gesellschaft für Ökologische Forschung 2005

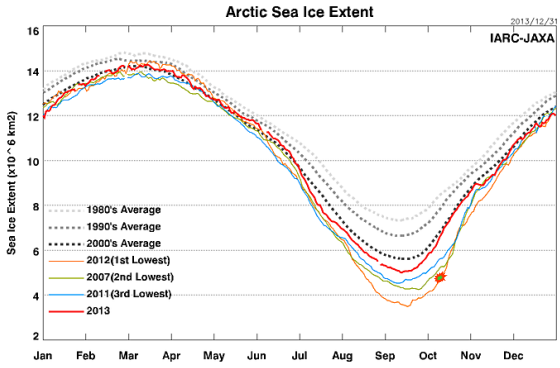


Cross-section through the glacier Pasterze

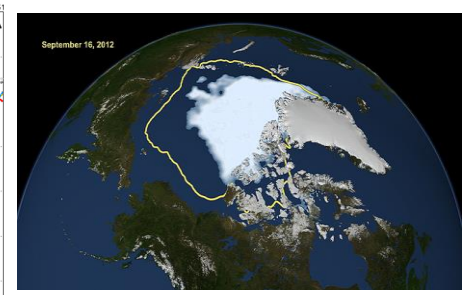
Perito Moreno, Patagonia

Source: Institut für Geographie und Raumforschung

Arctic sea ice situation



The latest value:
4,752,656 km² (October 12, 2012)



Following the record minimum that was set on September 16, 2012, Arctic sea ice has started its seasonal pattern of growth; maximum seasonal extent is expected to be reached by the end of March of next year.

Source: National Snow and Ice Data Center

Political objectives

We must strike a new path:

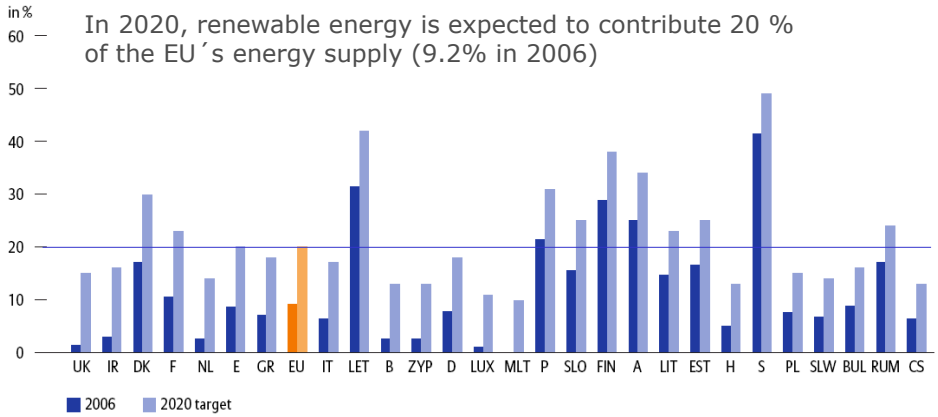
1. increase the sustainable and renewable energy sources (sun-, wind-, geothermal-, biomass-, water- and waves/tides-energy)

→ long-term concept

2. reduce the energy consumption in all sectors

→ short-term concept

Political objectives in renewable energy for 2020



Source: European Commission, Presentation: AllianzGI Capital Market Analysis

Index of abbreviations: UK – United Kingdom, IR – Ireland, DK – Denmark, F – France, NL – Netherlands, E – Spain, GR – Greece, EU – European Union, IT – Italy, LET – Latvia, B – Belgium, ZYP – Cyprus, D – Germany, LUX – Luxemburg, MLT – Malta, P – Portugal, SLO – Slovenia, FIN – Finland, A – Austria, LIT – Lithuania, EST – Estonia, H – Hungary, PL – Poland, SLW – Slovakia, BUL – Bulgaria, RUM – Romania, CS – Czech Republik

Political decisions and objectives in Germany

September 2010

Extension of nuclear power plants

May 2011

Germany Nuclear Power Plants to be entirely shut down by 2022

Germany's government temporarily halted plans to extend the life of its nuclear power plants, as two hydrogen explosions at a tsunami-stricken Japanese facility spread jitters about atomic energy safety in Europe.

Political decisions and objectives in Germany

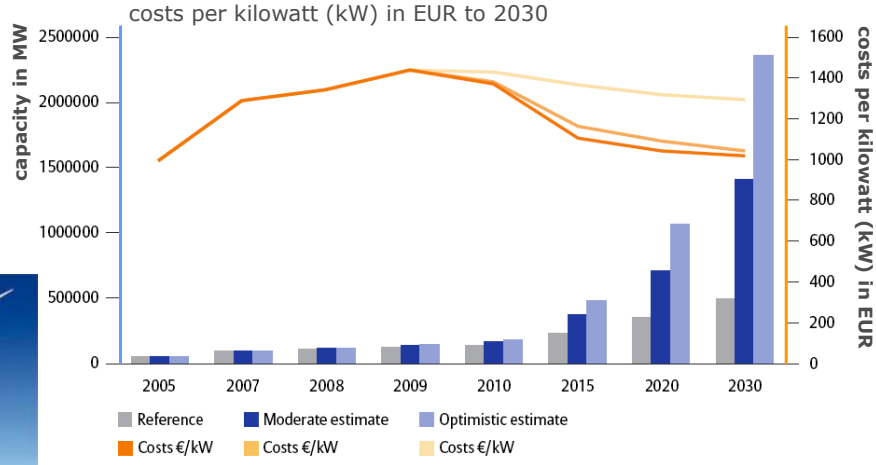
In Germany (as of July 2012), 9 nuclear power plants with an electric gross output of 12,696 MW are in operation. In 2011 they generated 107.9 billion kWh of electricity (including the 8 plants shut down in 2011).

Permanently shutdown on 6 August 2011:

Biblis A and B,
Brunsbuettel,
Isar 1,
Kruemmel,
Neckarwestheim 1,
Philippsburg 1 and
Unterweser

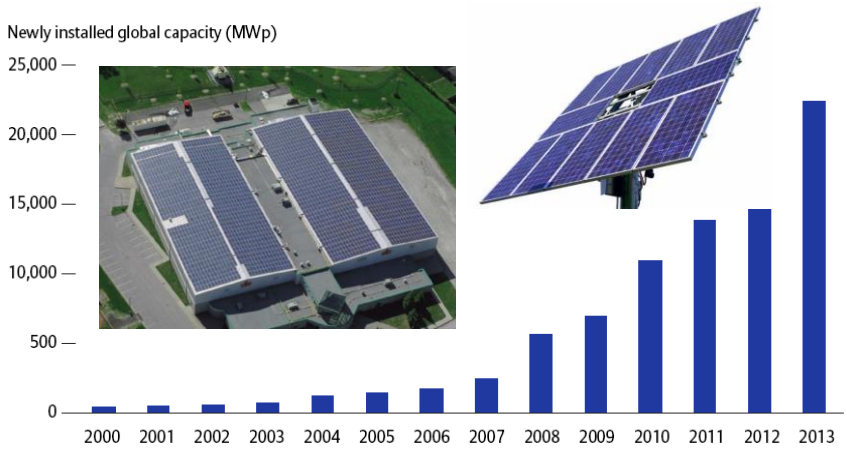
Market of the future: wind energy

Global cumulative wind capacity in MW and costs per kilowatt (kW) in EUR to 2030



Source: GWEC; Presentation: Allianz GI Capital Market Analysis

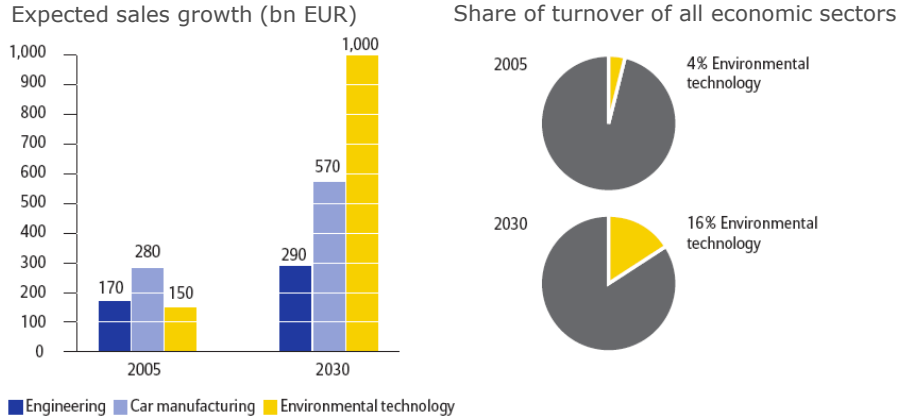
Solar: energy source of the future



Source: European PhotoVoltaic Industry Association (EPIA);
Presentation: Allianz GI Capital Market Analysis

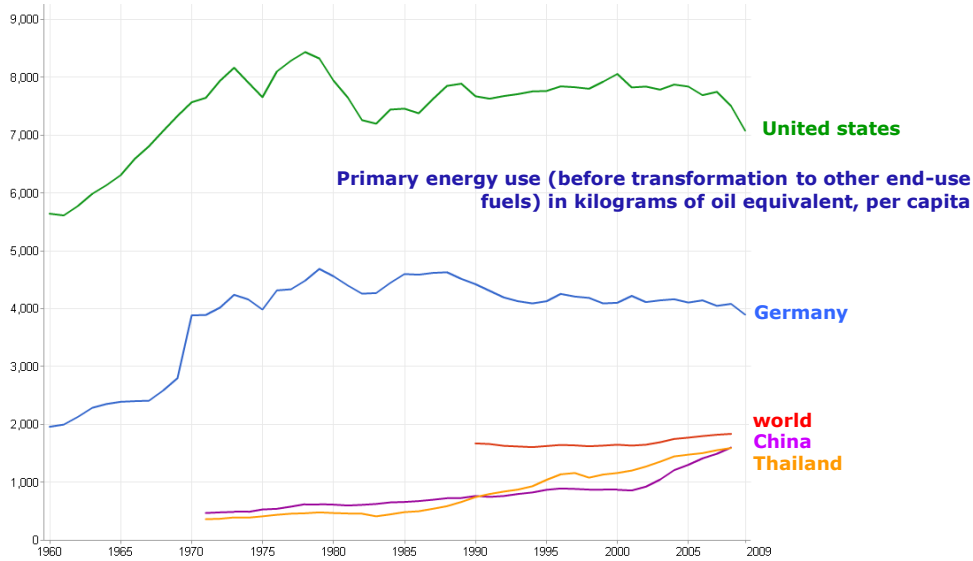
Green Energy: an enormous and growing market

Sales growth and share of turnover of all economic sectors in Germany



Source: BMU, 2006, ZUkunftsinstitut; Illustration: Allianz GI Capital Market Analysis

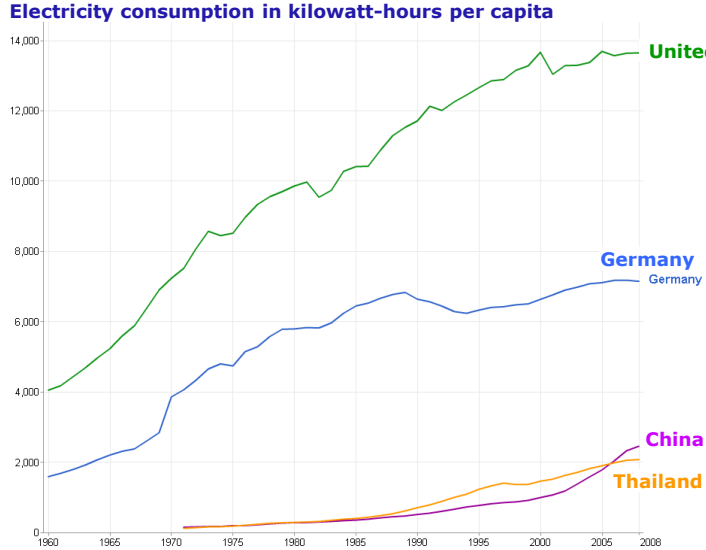
Energy use per capita



Source: Data from: World Bank, World Develoment Indicators; Last updated: Jul 21, 2011

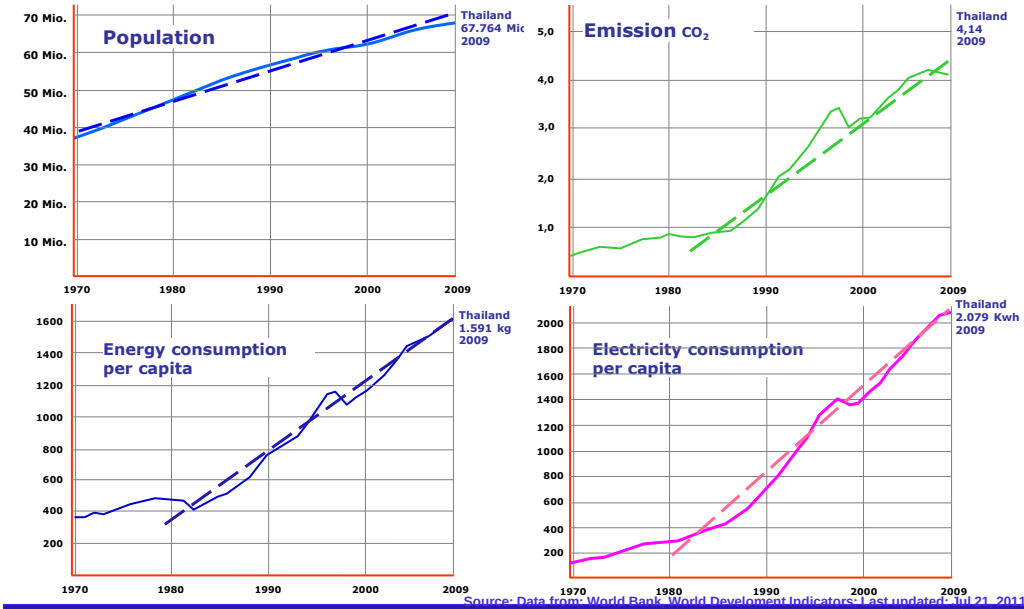
Electricity consumption

Electricity consumption in kilowatt-hours per capita



Source: Data from: World Bank, World Develoment Indicators; Last updated: Jul 21, 2011

Population and Energy in Thailand



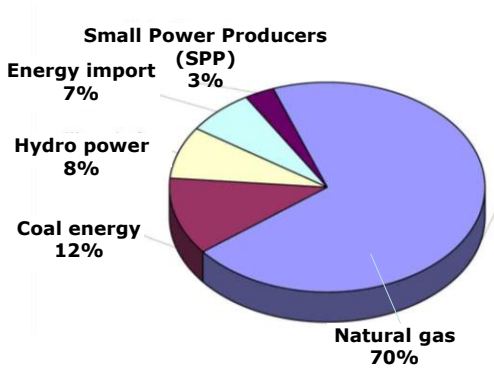
Source: Data from: World Bank, World Development Indicators; Last updated: Jul 21, 2011

Energy consumption in Thailand

- Metropolitan Electricity Authority (MEA) pre-estimate an electricity consumption rate in 2011 of 3.1 % (2010: 7.8 %); electricity consumption in 2011: 46.4 bn kWh; (157 bn THB)
- Electricity Generating Authority of Thailand (Egat): electricity consumption rate of 5.5 %
- Siam Commercial Bank forecast to 2020 an average rate of 4% per annum, for dwelling 5% per annum.
- Energy efficiency activities are acceptable to reduce the consumption; possible savings can be attained by excessively low-current "Air Conditioner".
  → Thailand could abandon the construction of a 800-MW-Power-plant about 20 bn THB.

Asien Kurier 3/2011; 1st march 2011

Energy sources in Thailand

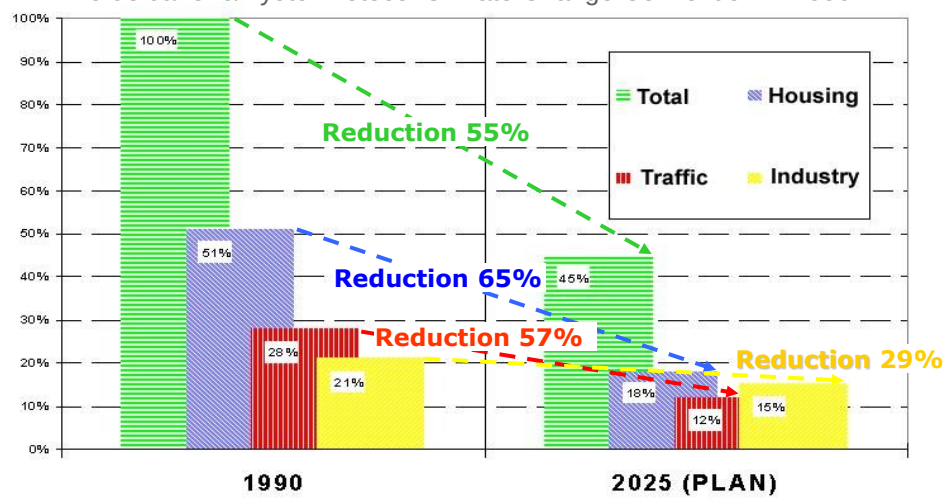


Energy consumption for sectors			
	2008 (Ktoe)*	2009 (Ktoe)	Share
Agriculture	3.446	3.477	5.2%
Industry	24.421	24.060	36.1%
Dwelling	9.958	10.089	15.1%
Commerce	4.968	4.940	7.4%
Carriage/traffic	23.097	24.132	36.2%
Total	65.890	66.698	100%
*Kt mineral-oil equivalent, actual figures 2011			
Source: department of Alternative Energy Development and Efficiency			

Source: Small Power Producers (SPP); gtai, cologne

Goals for Reduction of Energy Consumption

Rio de Janeiro/Kyoto Protocol Climate Change Convention in 1990



Requirements

What are the present requirements
for buildings in Germany and Europe?

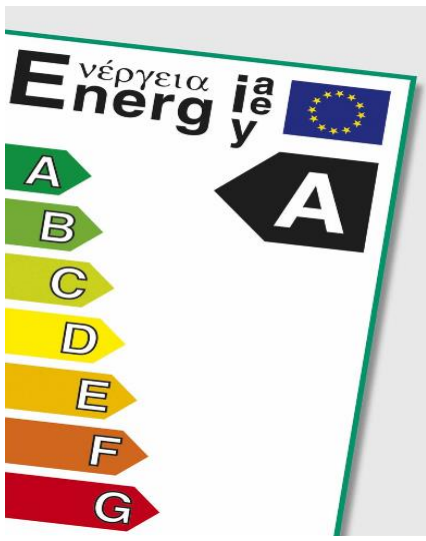
Legal Requirements

- Thermal insulation
- Protection from moisture
- Sound insulation
- Fire safety

Individual Demands

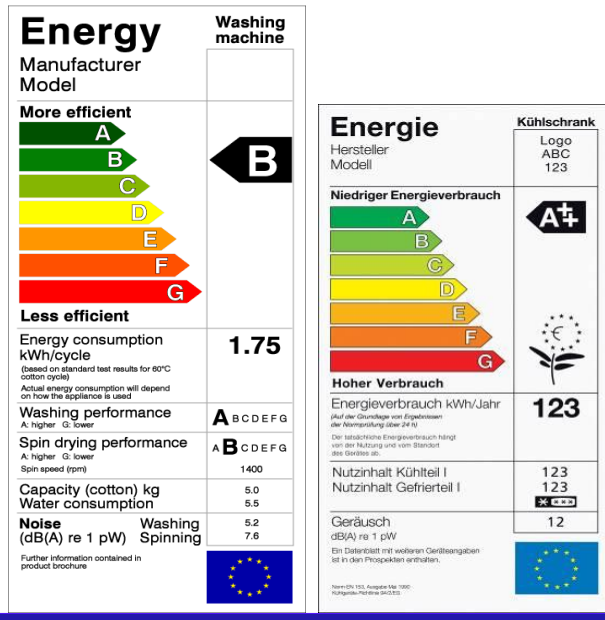
- Interesting architecture
- Good quality of labour
- Energy efficient construction
- Cost and time efficient realization
- Variability of dwelling

Energy label in Europe



Evaluation systems for energy efficiency in summer and winter

Energy labels for "white goods"



Product

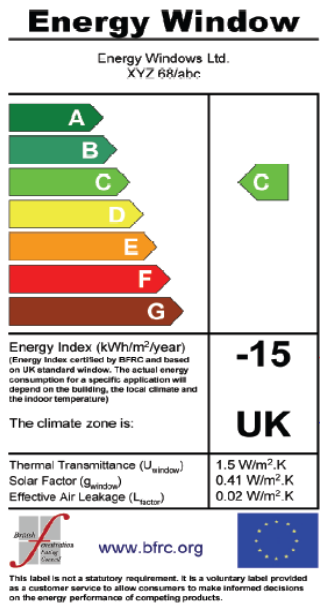
Illustration "eye-catcher"

Characteristics and additional information

Labelling Organisation

Report, Prof. Dr. Franz Feldmeier

Energy labels for windows



UK BFRC-Rating

- U **Thermal transmittance**
- g **Solar factor g**
- L **Effective Air Leakage**

$$Index = 218{,}6 \cdot g - 68{,}5(U + L)$$

Solar gain factor ↑ ↑ heat loss factor

Index kWh/m²/year

Climate zone

Rating

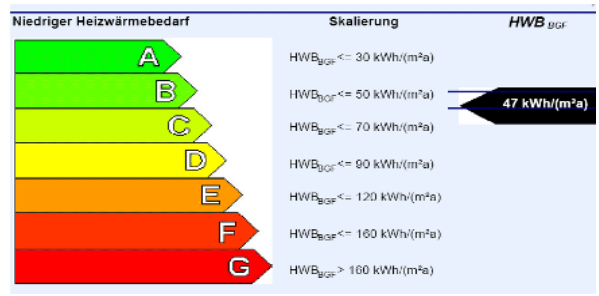
BFRC Ratings	
kWh/m²/year	A – G scale
≥0	A
-10 to <0	B
-20 to <-10	C
-30 to <-20	D
-50 to <-30	E
-70 to <-50	F
<-70	G

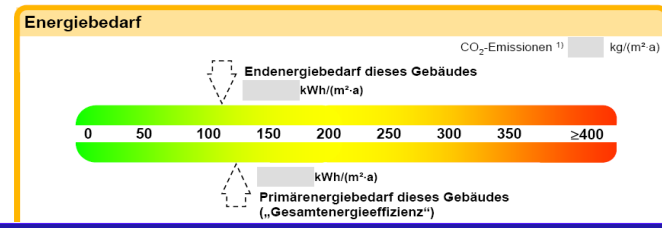
Report, Prof. Dr. Franz Feldmeier

Energy labels for building

EnEV Energy label

Building Energy label

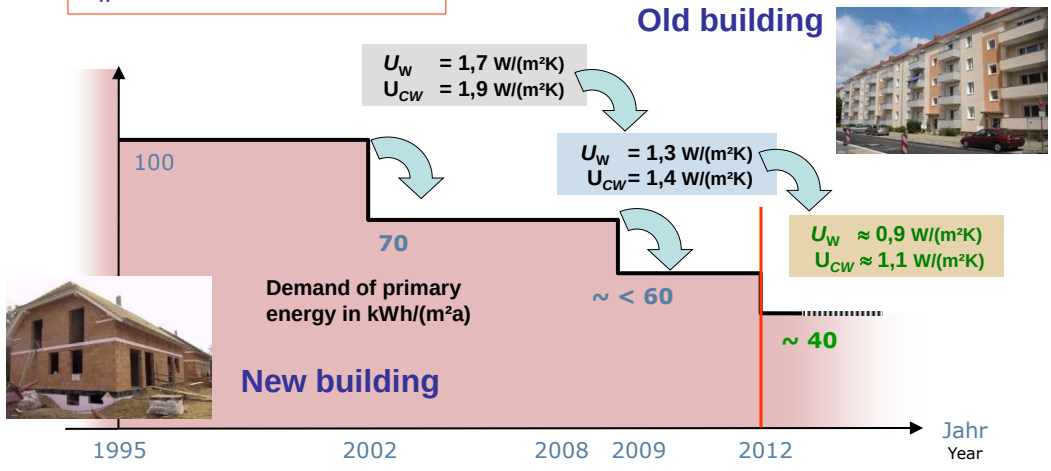




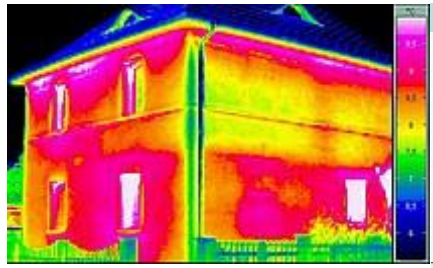
Report, Prof. Dr. Franz Feldmeier

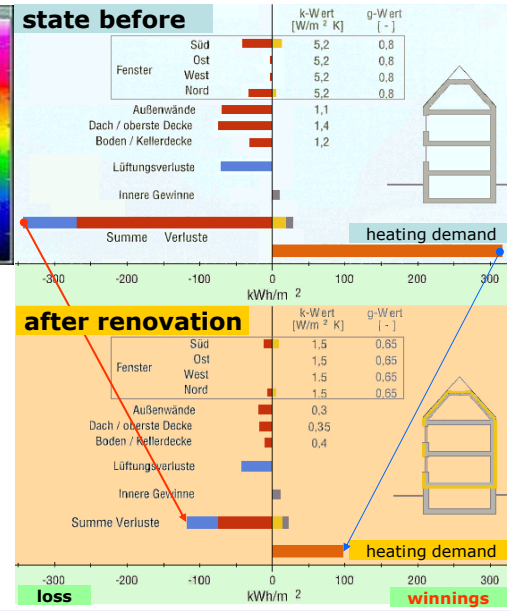
Development of the requirements (residential buildings)

U = Thermal transmittance
U_W = Minimum-value



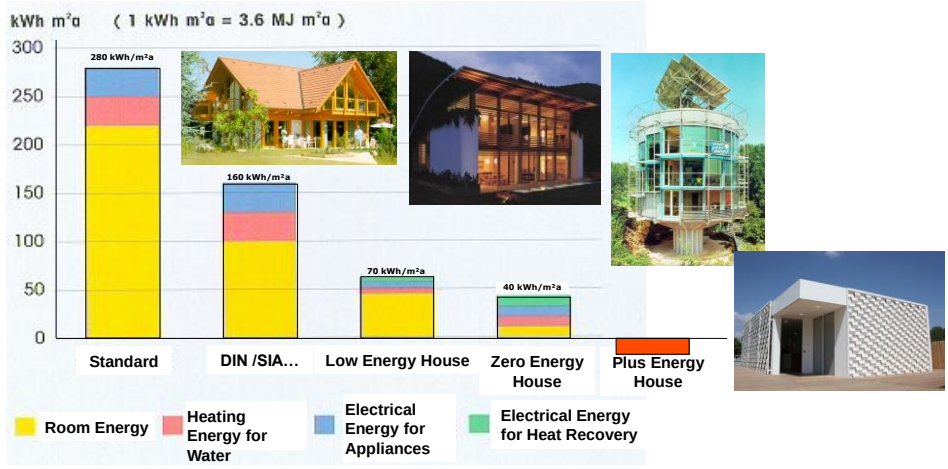
Energy labels for building





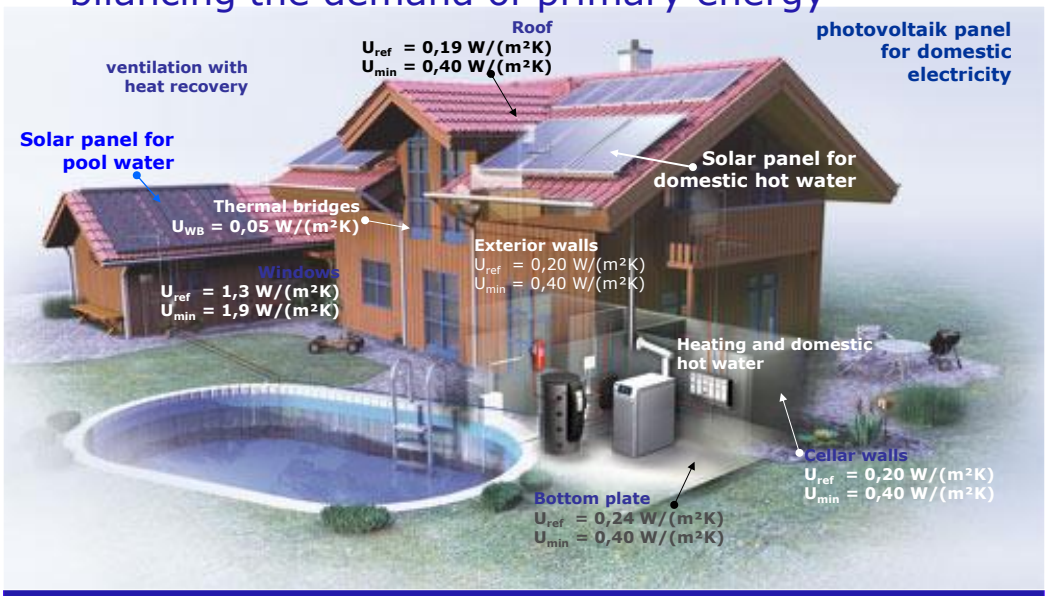
Report, Prof. Dr. Franz Feldmeier

Energy Consumption in buildings

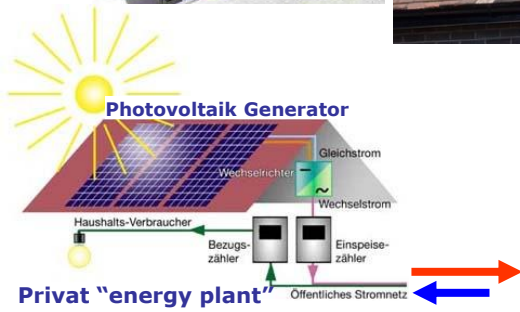


Comparison:
Energy consumption of different standards in building technology

Reference building for bilancing the demand of primary energy



Solar Collectors for Electricity and hot Water

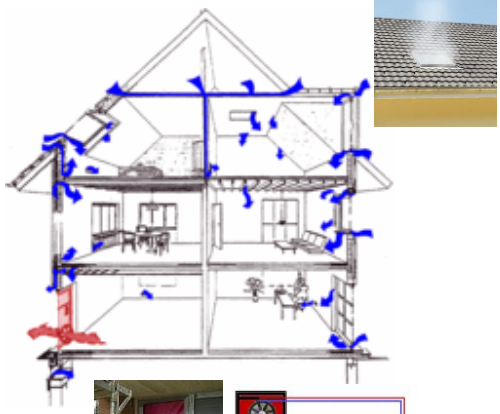


Renewable Energy Law:

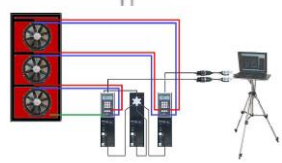
fixed price for 20 years

amortisation after 20-25 years with 9% rate of return

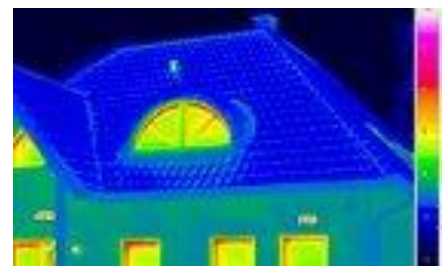
Measuring methods for energy consumption



Blower Door:
Slight Fogger
Heavy Fogger



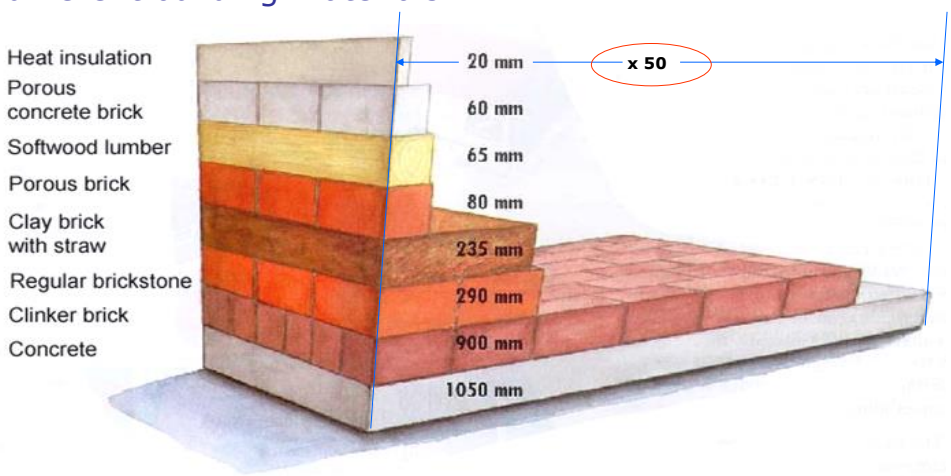
Thermography



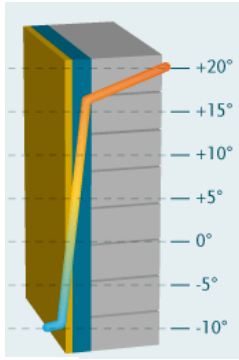
Picture thermal-camera

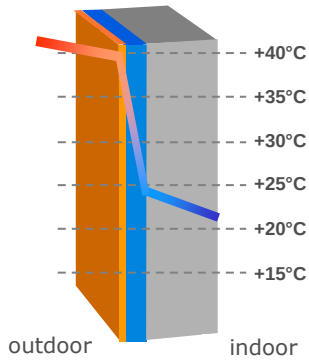
Thermal properties in relation

Relation of thermal properties of different building materials

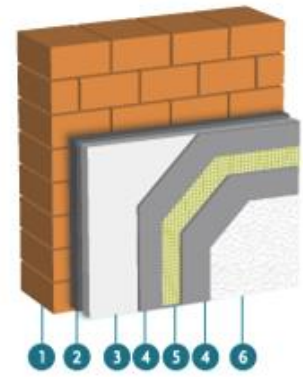


Exterial insulation of a wall





Temperature gradation of an exterior insulation by WDVS-Thermal Insulation Composit System



(1) wall
(2) adhesive
(3) expanded plastic slab
(4) armor plaster
(5) fiber glass reinforcement
(6) plaster

Cross section of a wall with exterior insulation by WDVS-Thermal Insulation Composit System

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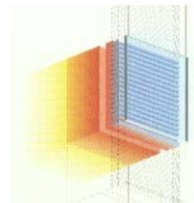
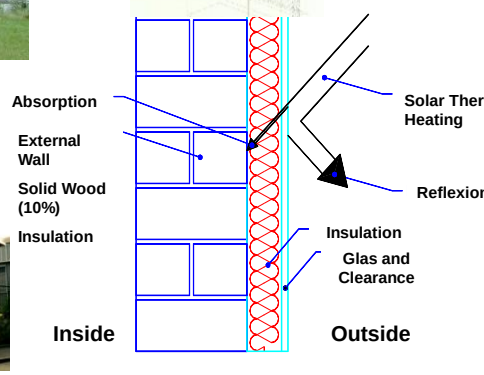
Insulation Trends – Accumulator System





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Exterial insulation of a wall

Picture thermal-camera

bevor and after the insulation of external walls

Heating costs of an one family dwelling

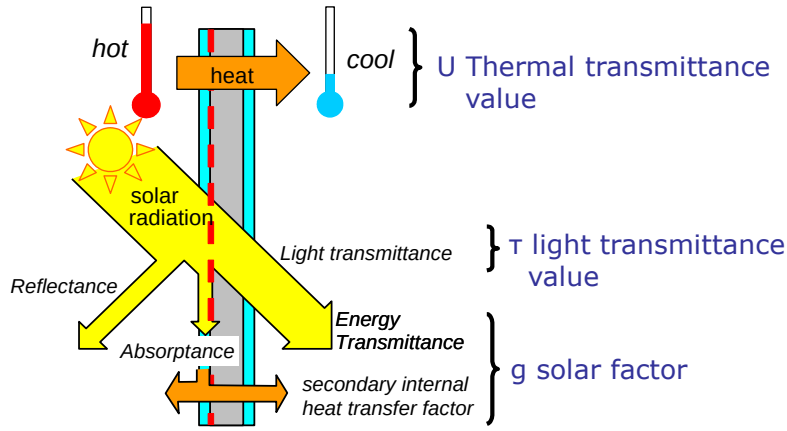
Comparision: reconstructed and not reconstructed

Costs of insulation in Germany

Outer walls with Styropor	95 – 130	€/m²
Inner walls insulation	30 – 40	€/m²
Upper ceiling	35 – 50	€/m²
Insulation roof	125 – 150	€/m²
Insulation flat roof	70 – 100	€/m²
Change window glass	130 – 200	€/m²
Change window (with frame)	250 – 450	€/m²

- Double-glasses windows:
  the **thermal loss is 60 % lower** than Single-glasses
- Triple-glasses windows:
  the **thermal loss is 85 %** lower than Single-glasses

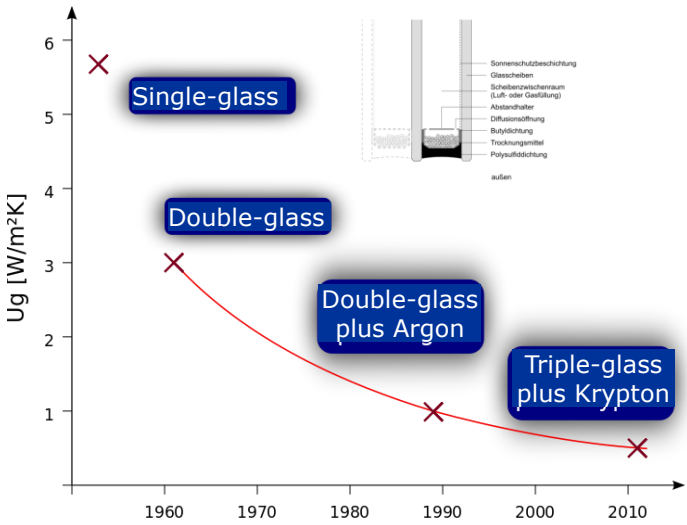
Windows and Glass facades

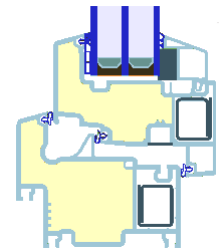


Characteristic values of glazing

Report, Prof. Dr. Franz Feldmeier

Insulation glazing

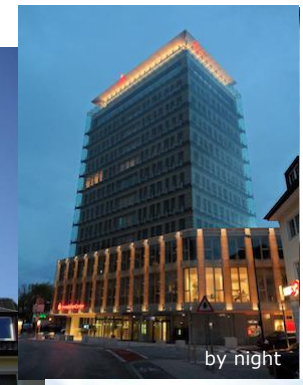




Example of modern plastic window profiles with insulated glazing

Thermal transmission in different window glasses

Modern „Green Buildings"
Energy-saving features of a facade



Renewed old building (2010) in Rosenheim

Thin-film technology

Model of Energy^3:
Saving Energy –Generating Energy – Networking Energy.
What sets the new module apart is the innovative combination of photovoltaic thin-film technology with tried-and-tested window and façade systems.
For example, non-ventilated façades, skylights, ventilated façades, lean-to façades, or solar shading. The result is extraordinary solar architecture, which sets new standards in terms of efficiency and design.

Source: http://www.schueco.com/web/th

Project: „Kindergarten Rosenheim“ in Thailand

Kindergarten Rosenheim
building site

Benefit for companies

- Reduction of energy consumption
  - decreasing of energy costs
- Improvement of indoor climate
  - comfortable feeling indoor for customers and staff
- Brand label „Green company“
  - Certification e.g. by the US Green Building Council (USGBC))

Recommendations in Higher Education for future

- Start up of „Green Technology Project“ e.g. „Green building“ as a research and demonstration project
- Lectures for students and staff members in “Environmental and Green Technology“ at universities
- Cooperations with partners

Hochschule Rosenheim University of Applied Sciences

Fraunhofer IBP

ift ROSENHEIM

- We should not wait for political decisions!
  We should act on our own initiative!

Then we can say:

“We have borrowed the earth from our children and we can hand it back to them”!


We need the „Green Technology“
for our blue Planet


Time is running
Thank´s for your attention