
Gemstones

## Diamond prices

Prices are for brilliant cut diamonds. Calculated with <http://findmyrock.com/diamond-calculator/>

**Carat:**  
 Base: Diamond of G color and VS1 Clarity will be:  
 0.50 carats: 4'000 to 5000\$/ct  
 1.0 carat : 9'000 to 11'000\$/ct  
 2.0 carats: 18'000 to 20'000\$/ct  
 3.0 carats: 90'000 to 110'000\$/ct


Color (yellow hues up to light yellow):	1carat	2carat	3carat
Diamond VS1 Clarity			
G color:	9'000 to 11'000\$/ct	18'000 to 20'000\$/ct	31'000 to 33'000\$/ct
D color:	14'000 to 16'000\$/ct	30'000 to 32'000\$/ct	50'000 to 52'000\$/ct
K color:	5'000 to 7'000\$/ct	8'000 to 10'000\$/ct	13'000 to 15'000\$/ct


  

Clarity	1 carat	2carat	3 carat
Diamond G color			
VS1 clarity:	9'000 to 11'000\$/ct	18'000 to 20'000\$/ct	31'000 to 33'000\$/ct
IF clarity:	14'000 to 16'000 \$/ct	28'000 to 30'000\$/ct	47'000 to 49'000\$/ct
I2 clarity:	2'000 to 3'000 \$/ct	2'500 to 3'500\$/ct	3'000 to 5'000\$/ct

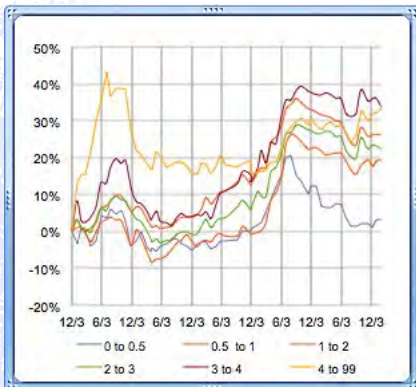
Worst one carat diamond M I3: 800 to 1'500\$/ct  
 Best one carat diamond D IF: 28'000 to 30'000 \$/ct  
 Worst three carat diamond M I3: 1'500 to 1'700\$/ct  
 Best 3carat diamond D IF: 110'000 to 112'000\$/ct  
 Synthetic diamonds: 500 – 1000\$/ct

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## Diamond price evolution




The diamond price chart to the left shows price changes in percent of 2007 prices for loose diamonds since 2007 for D-I color VVS2-SI2 clarity in several carat ranges

<http://www.pricerscope.com/diamond-search-results>


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## Most expensive colorless diamond I



A rare flawless white diamond was sold at Sotheby's in Geneva and fetched a whopping cost of \$16.2 million. Brilliant-cut diamond, weighing 84.37 carats, was bought by Georges Marciano, the founder of clothing company Guess? Inc. It is the priciest colorless diamond sold in the last 20 years.


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## Most valuable colorless diamonds







India's most famous diamond, Koh-I-Noor, discovered in Andhra Pradesh state, passed from one to ruler to another is now a part of British crown jewel. British East India Company seized this largest diamond ever before the Indian independence. This of course is the most expensive diamond along with the Sancy Diamond. The diamond is currently set into the Crown of Queen Elizabeth and is on display at the Tower of London. The 105.6 carat stone has no estimation

The Cullinan diamond is the largest gem-quality diamond ever found, at 3106.75 carat rough weight., It was found January 26, 1905, in the Premier No. 2 mine, near Pretoria, South Africa.

The largest polished gem from the stone is named Cullinan I or the Great Star of Africa, and at 530.4 carats (106.1 g) was the largest polished diamond in the world until the 1985 discovery of the Golden Jubilee Diamond, 545.67 carats (109.13 g, rough weight 755.5ct), also from the Premier Mine. Cullinan I is now mounted in the head of the Sceptre with the Cross., which is part of the British crown jewels. Price estimation: 400Mio\$


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## Fancy diamond prices







Fancy (all colors but light yellow hues) and historic diamonds may reach much higher price levels than indicated in the previous list. Christie's sold the Wittelsbach diamond (Bavarian crown jewel) for \$24,311,191 in 2008. The fancy deep grayish blue diamond with VS2 clarity weighs 35.56-carat i.e. the carat price is 683'000\$/ct

A "vivid pink", near perfect SA mined 5 carat diamond fetched a 10.8 million \$ price tag at an auction in Honkong last february. This puts the world record carat price at 2.2 million\$

<http://www.bornrich.com/entry/expensive-diamonds-sold-auction/>


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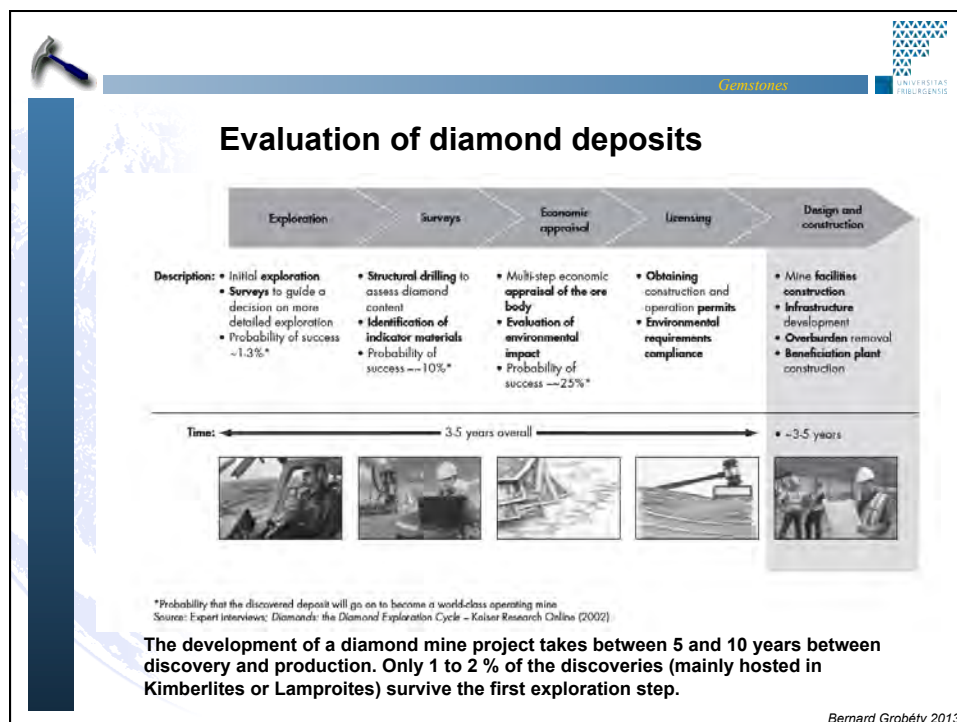
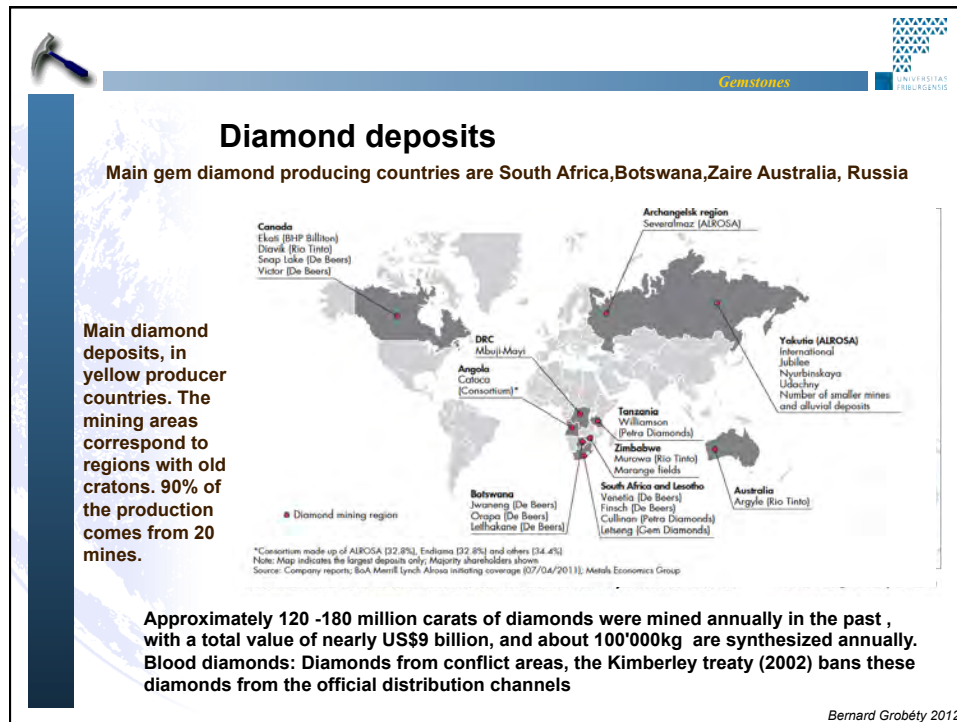
## Hope diamond

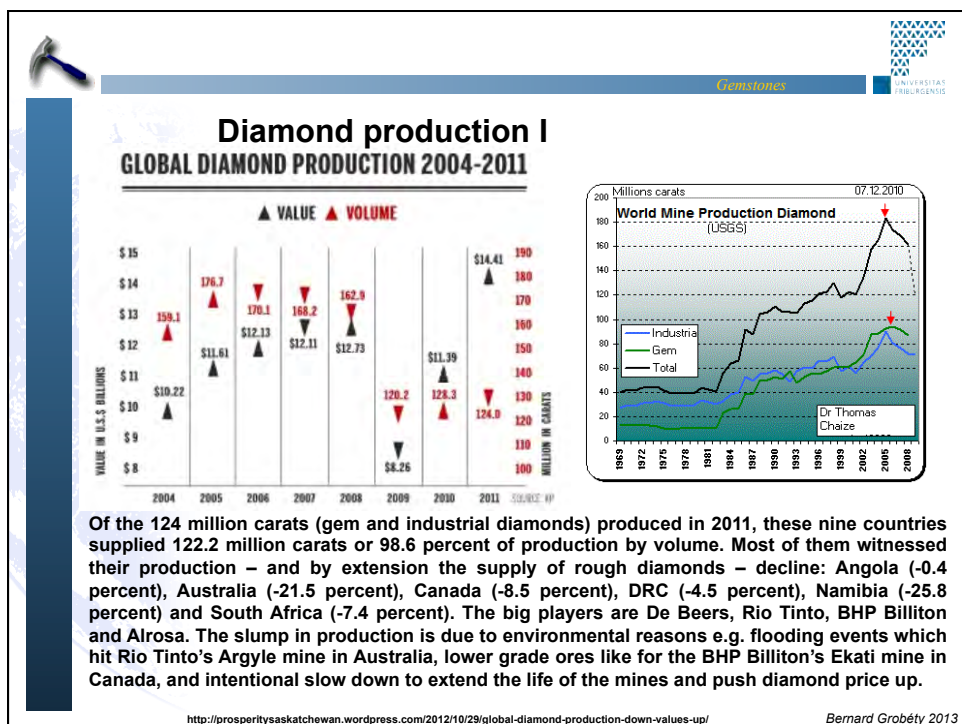
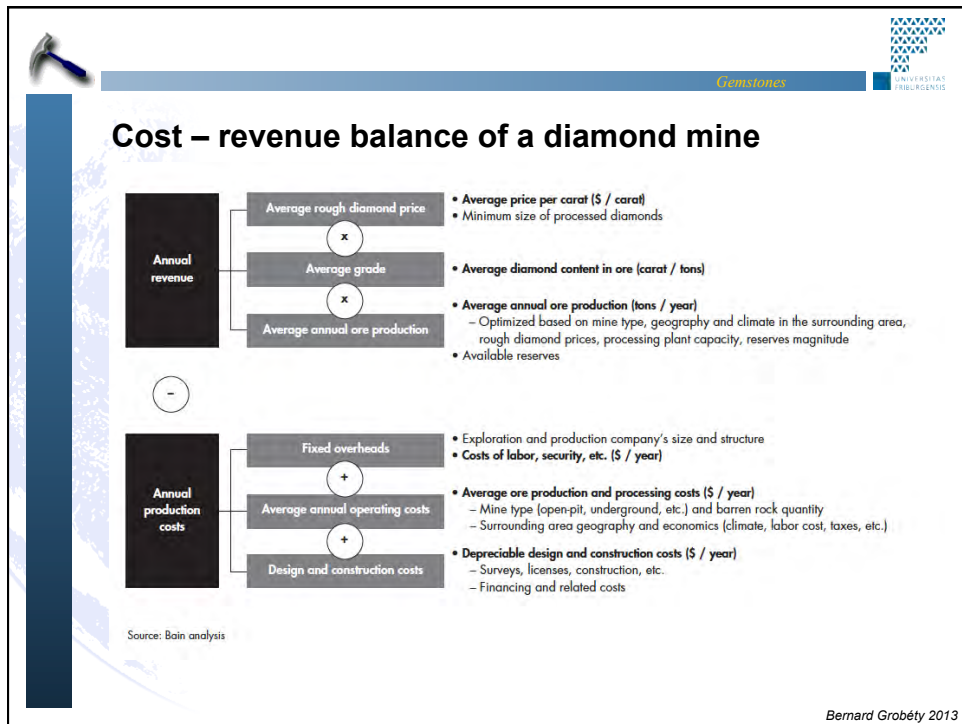




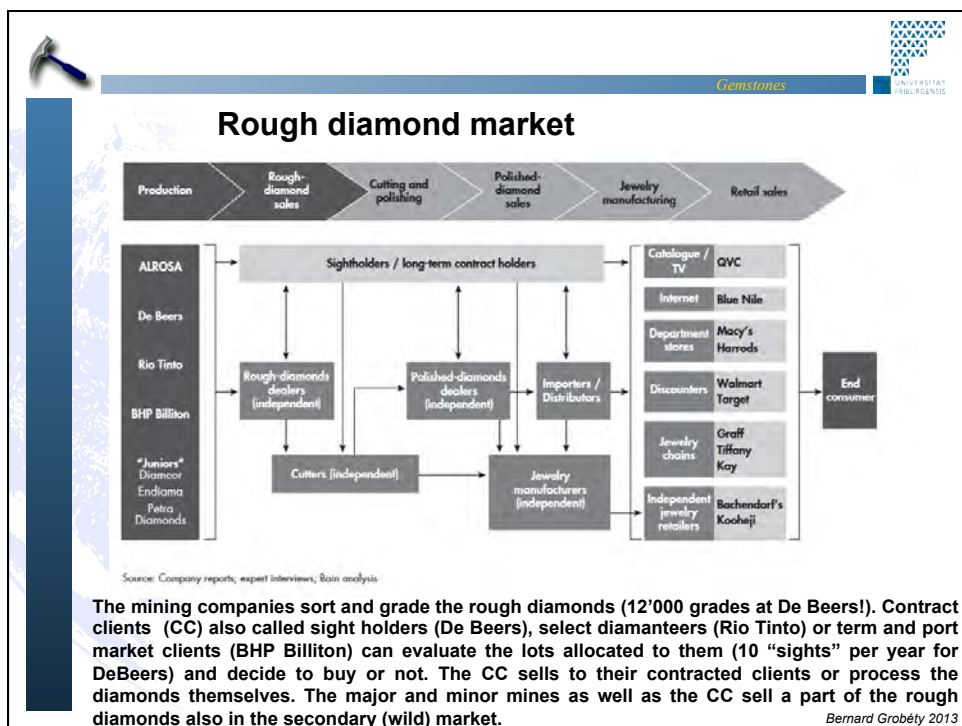
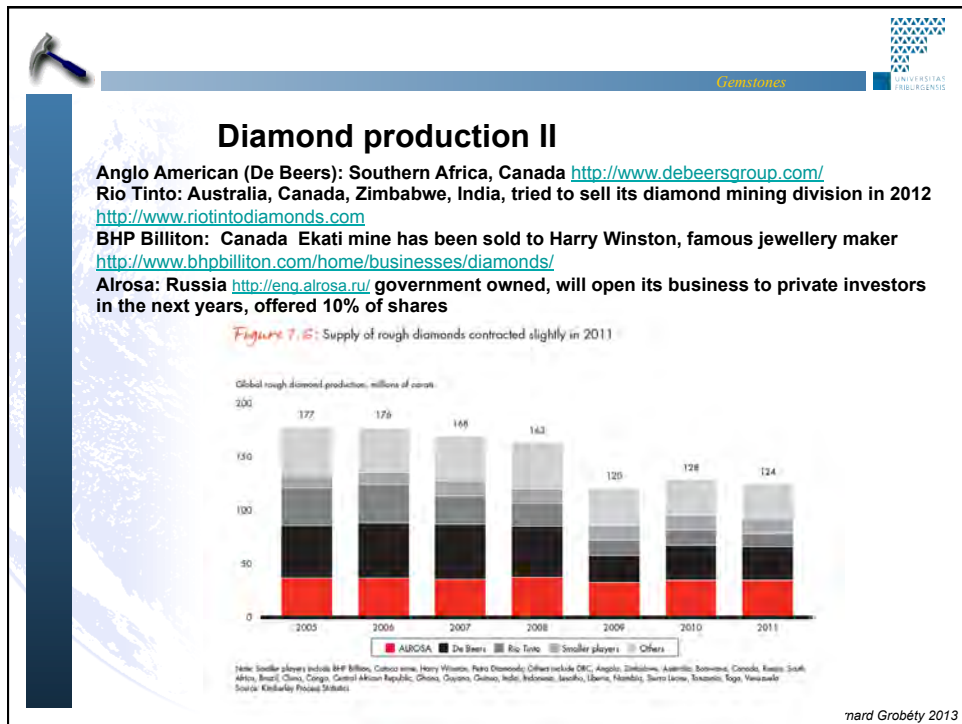
The Hope diamond is a deep blue diamond, which is owned by the Natural History Museum at the Smithsonian (Government owned) The 45.5 carat stone has a very tormented history full of sex and crime, which started in India in the 17<sup>th</sup> century. The Hope diamond was probably possession of the French court (Louis IX – XVI) and English court (George before going into private ownership). The name comes from the jeweller James Hope, who owned it from 1839 to 1861. In the twentieth century the stone was owned by the McLean family first and then by the famous jewellers, Harry Winston, who offered it to the Smithsonian. The Hope Diamond is valued 250 Mio\$, which makes it the diamond with the highest per carat value!

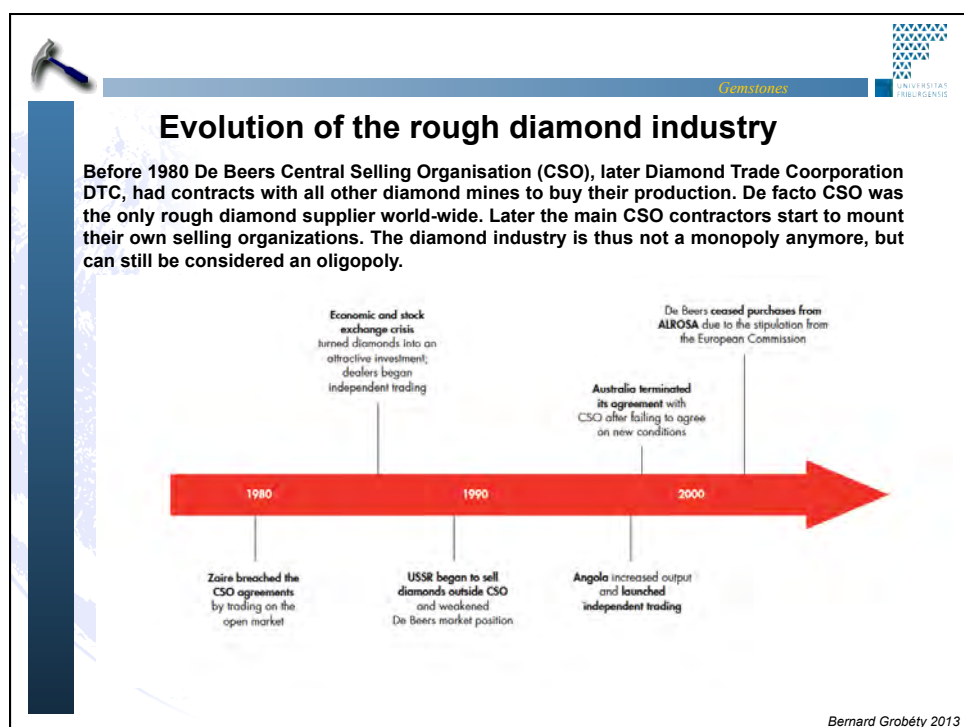
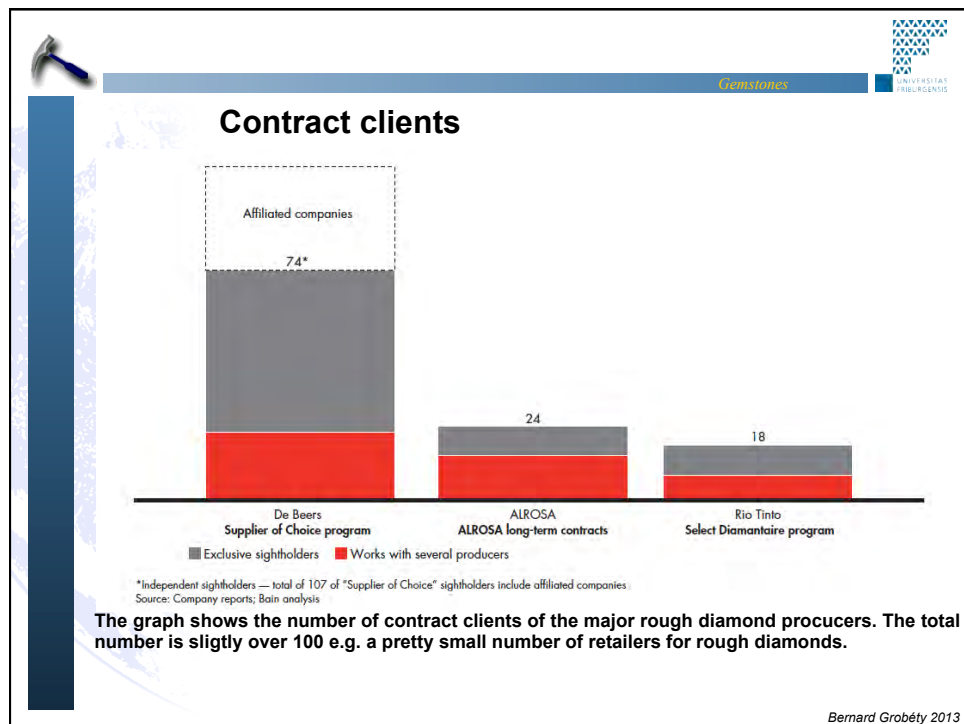
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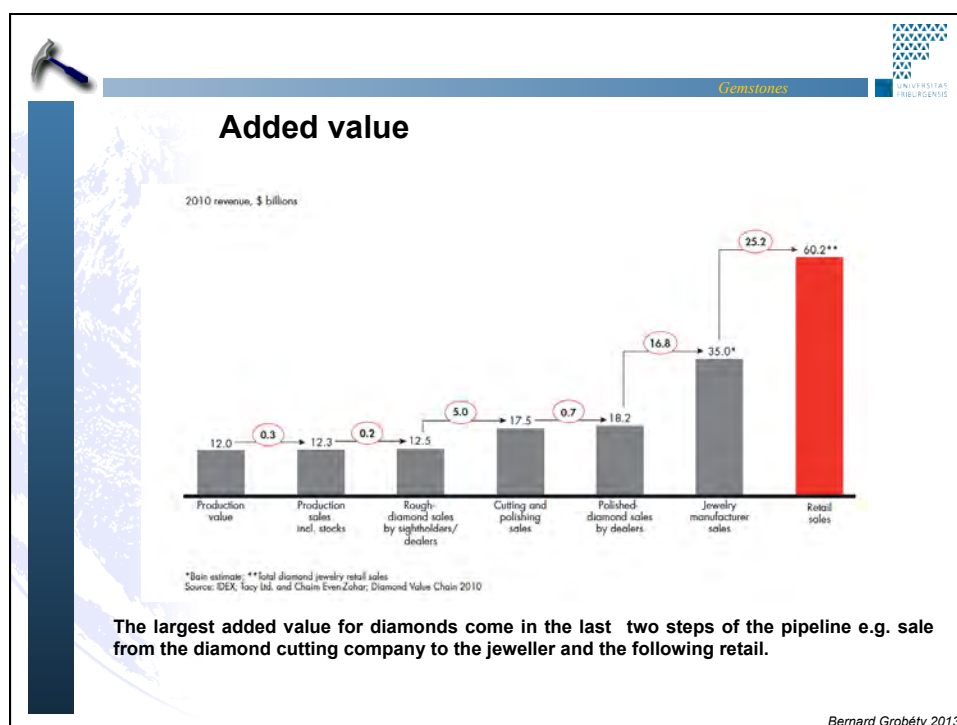
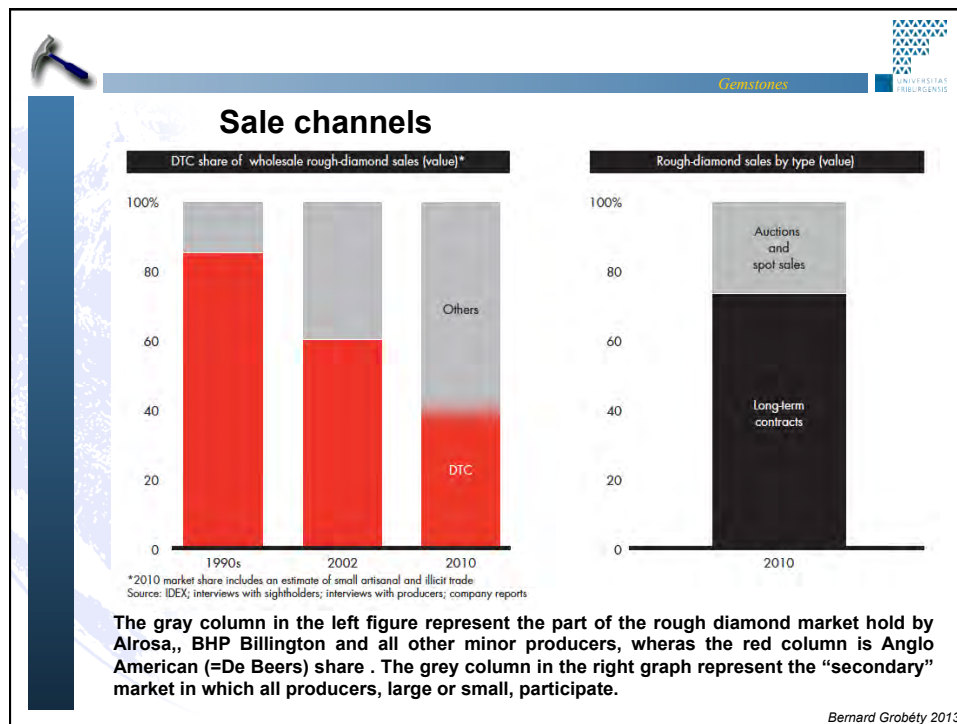










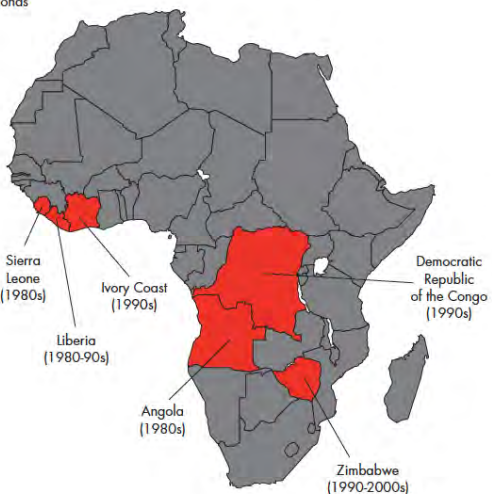




**„Blood“ diamonds**

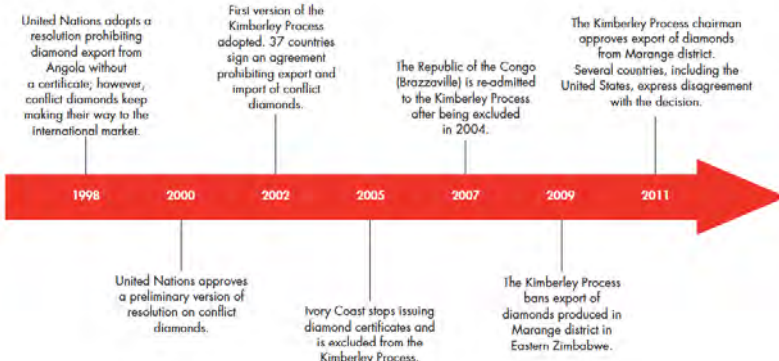
Source countries of conflict diamonds

“Blood” or conflict diamonds are used to sponsor rebel and revolutionary activities against legitimate and internationally recognized governments. In the 1990ties paramilitary or rebel groups in various politically unstable African countries had taken control of the diamond mines and were using the proceeds from diamond sales to finance their operations. Although these diamonds ended up in legitimate channels, they were either directly or indirectly funding violent conflict. Not surprisingly the Western media’s widespread coverage of the atrocities in these conflict zones—Angola, Sierra Leone, Liberia, the Democratic Republic of the Congo—began to damage the reputation of the diamond industry.



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**Kimberly Process**



United Nations adopts a resolution prohibiting diamond export from Angola without a certificate; however, conflict diamonds keep making their way to the international market.

First version of the Kimberly Process adopted. 37 countries sign an agreement prohibiting export and import of conflict diamonds.

The Republic of the Congo (Brazzaville) is re-admitted to the Kimberly Process after being excluded in 2004.

The Kimberly Process chairman approves export of diamonds from Marange district. Several countries, including the United States, express disagreement with the decision.

United Nations approves a preliminary version of resolution on conflict diamonds.

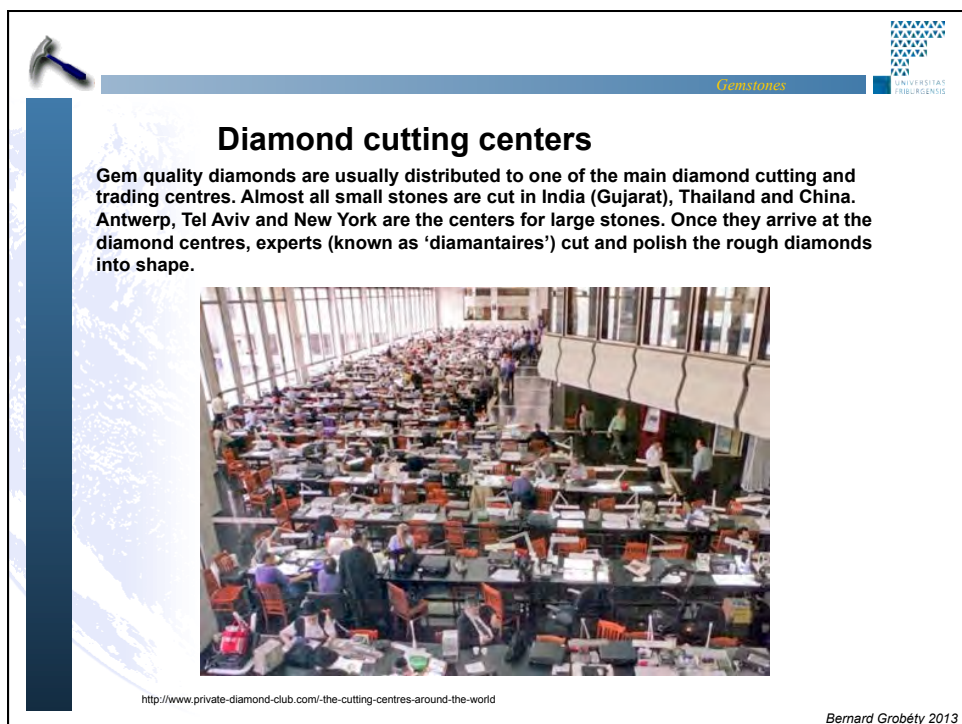
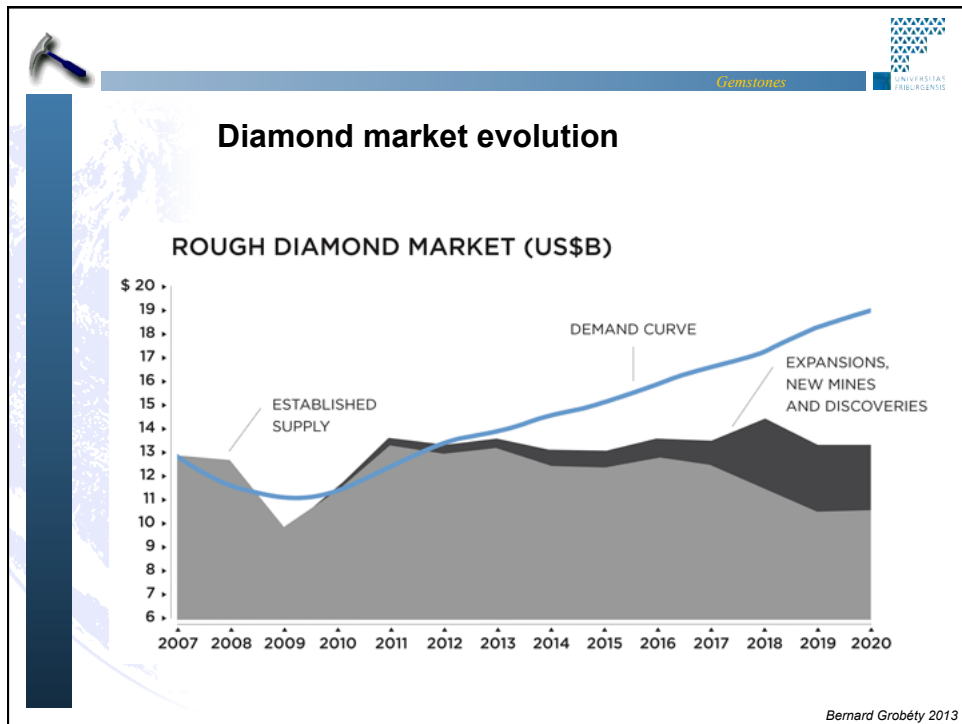
Ivory Coast stops issuing diamond certificates and is excluded from the Kimberly Process.

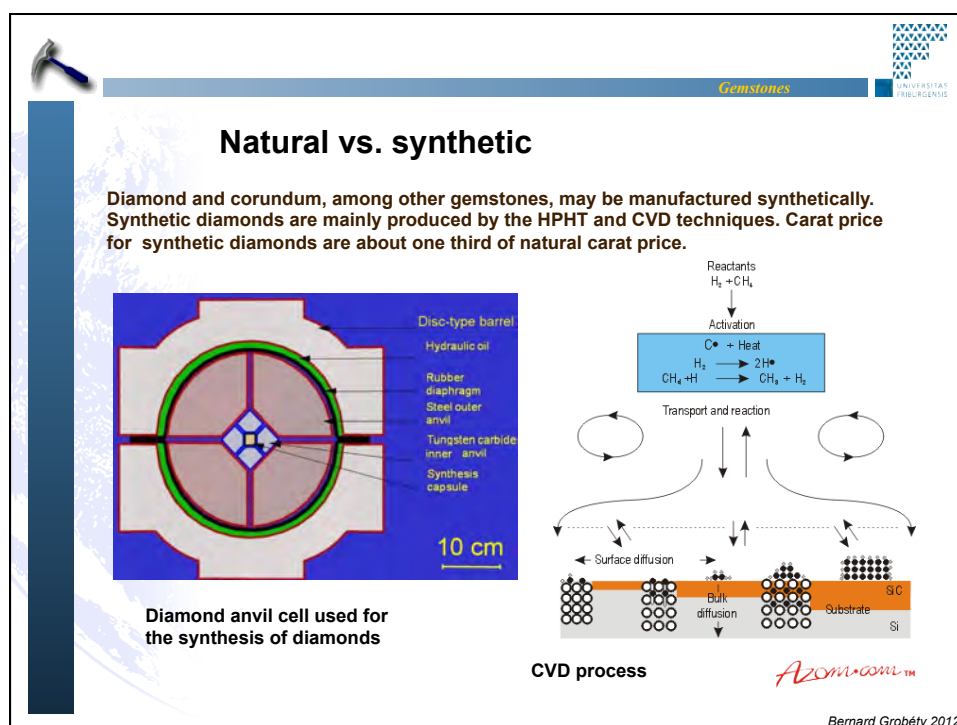
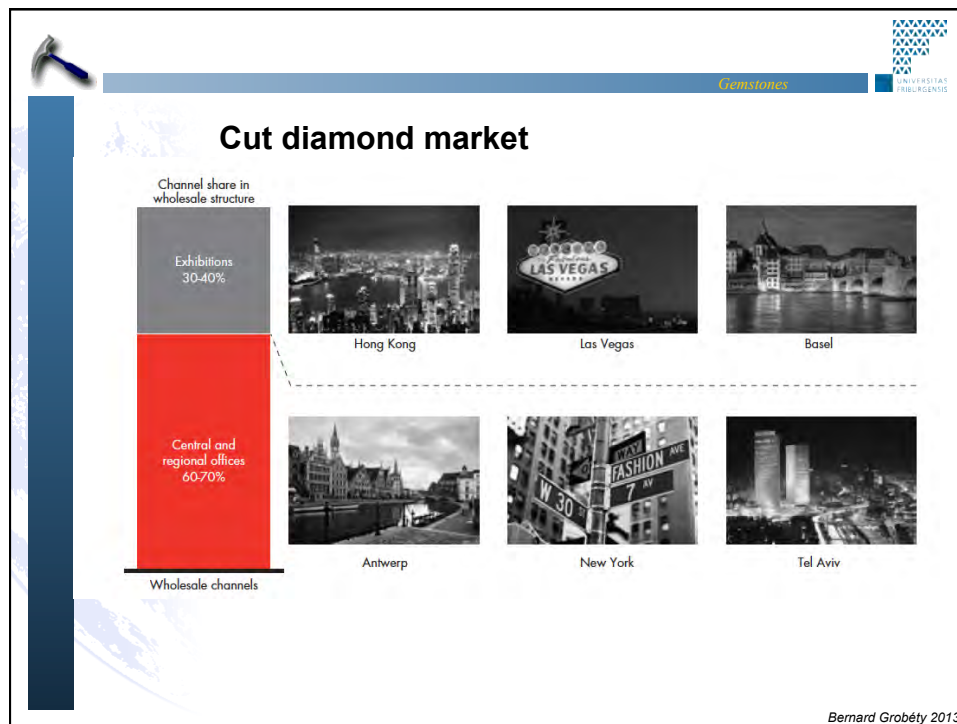
The Kimberly Process bans export of diamonds produced in Marange district in Eastern Zimbabwe.

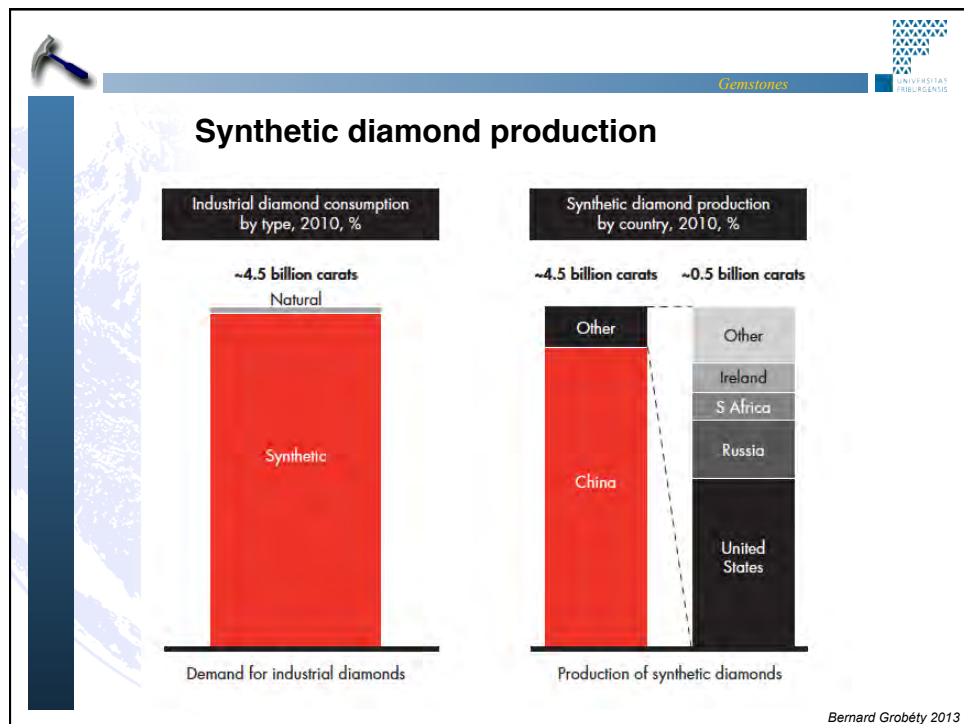
In response the Kimberly Process was established in 2002 under the auspices of the United Nations, it requires certification of all rough diamonds to guarantee that their trade does not finance rebel activities. The Kimberly Process Certification Scheme (KPCS) outlines the set of rules each participating country must meet. These rules include an agreement to restrict trade to participants, to refrain from assisting others in trading conflict diamonds and to provide auditable statistical data on mining, exports and imports of diamonds. On 5th December 2011 Global Witness, an initiator NGO of the Kimberly Process, announced its departure from the Kimberly Process,

<http://www.globalwitness.org/conflict-diamonds>

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**Diamond substitutes**

	Diamond	Zirconia	Sapphire	Moissanite
Composition	C	ZrO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	SiC
Crystal system	cubic	cubic	trigonal	hexagonal cubic
Hardness (Mohs)	10	8.25	9	9-9.5
Cleavage	excellent on (111)	none	none	none
Density	3.515	6.0	4.0	3.2
Refractive index (sodium light)	2.42	2.15-2.18	1.77	2.65
Dispersion	0.044	0.058-0.066	0.018	>0.08
Thermal conductivity (Wcm <sup>-1</sup> K <sup>-1</sup> )	5-25	0.1	0.4	0.9

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## Recognizing natural diamonds

Although they lower the carat price, inclusions and certain optical properties are the best way to assert the natural origin of a diamond. Synthetic diamond producers (De Beers, Apollo Inc.) fingerprint often chemically their products.



**Pyrope and Cr-diopside inclusions in natural diamonds**





**Metal inclusion in synthetic diamond**



**"Brown" deformation bands in natural diamond**

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## Diamond treatment I

**Before treatment**  
Light yellow  
(a few  $N_3$  centers)

**Irradiation**  
Creation of vacancies

**Heat-treatment**  
The vacancies move and get trapped at aggregates


**After treatment**  
Darker yellow, a few  $N_3$  centers + newly created  $H_3$  and  $H_4$  centers


■ A aggregate  
■  $N_3$  center  
■ B aggregate  
□ Vacancy  
■  $H_3$  center  
■  $H_4$  center

Irradiation and heat treatments may alter the defect concentration/distribution of color giving defects in diamonds. A light yellow diamond (color grade K) can be turned into a deep yellow, fancy diamond thereby increasing the value severalfold. Treatments have to be indicated in a gemstone report and may have an influence on the price.

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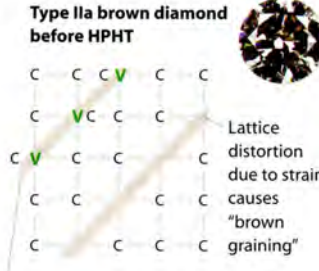




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## Diamond treatment II

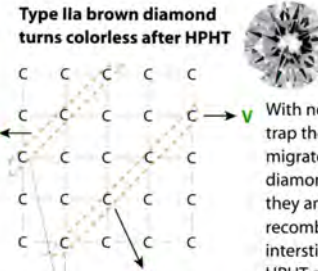
**Type IIa brown diamond before HPHT**



Lattice distortion due to strain causes "brown graining"

Plastic deformation results in abundant distorted and broken carbon bonds (and associated vacant lattice sites) concentrated along bands of brown color known by gemologists as "brown graining."


**Type IIa brown diamond turns colorless after HPHT**




With no impurities to trap them, vacancies migrate through the diamond lattice until they are eliminated by recombination with an interstitial C atom during HPHT annealing. No new color centers are formed.

HPHT treatment heals lattice distortions and broken bonds, releases vacancies, and thus removes brown color in graining, leaving only remnant colorless internal graining that is common in HPHT-treated diamonds.

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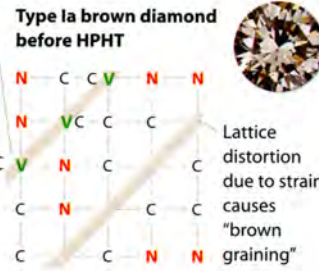




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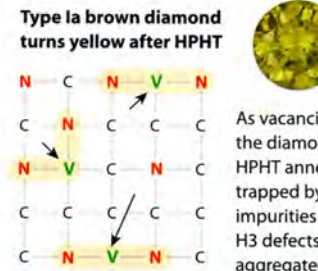
## Diamond treatment III

**Type Ia brown diamond before HPHT**



Lattice distortion due to strain causes "brown graining"

**Type Ia brown diamond turns yellow after HPHT**



As vacancies migrate through the diamond lattice during HPHT annealing, they are trapped by aggregated N impurities (A centers) to form H3 defects [N-V-N]<sup>0</sup>. Some aggregated N also breaks down to release isolated N atoms at high temperatures. The combination of H3 defects and isolated nitrogen imparts a yellow color to the diamond. If abundant N occurs adjacent to the original brown graining, H3 defects will become concentrated along the formerly brown grainlines and will appear as treated yellow graining.

C = carbon atom  
 N = nitrogen atom  
 V = lattice vacancy

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