Midlincoln Research

GOLD, PLATINUM AND PALLADIUM

SUPPORT FOR GOLD AND PGM
APRIL 2019

Support for Gold and PGM

- Gold, Platinum and Palladium
- Gold investment is a tiny 1.8% of total financial assets
- Cost support for gold price
- Value of Gold Mined in 2017 of 3150t at 1250/oz and costs
- Historic Gold Price $/oz
- The case for Palladium and Platinum
- Platinum and Palladium Usage
- Internal Combustion vs. Hybrids and Electric Vehicles
- Use of Platinum and Palladium
- Evolution of Ecological Standards
- Probably there is not enough lithium to satisfy energy needs of Electric cars
- At the current Pt and Pd levels global ex Russia companies are returning to profitability. Russia has a cushion.
- Before Pt Hike most S. African producers had operated at loss
- The Case for Platinum
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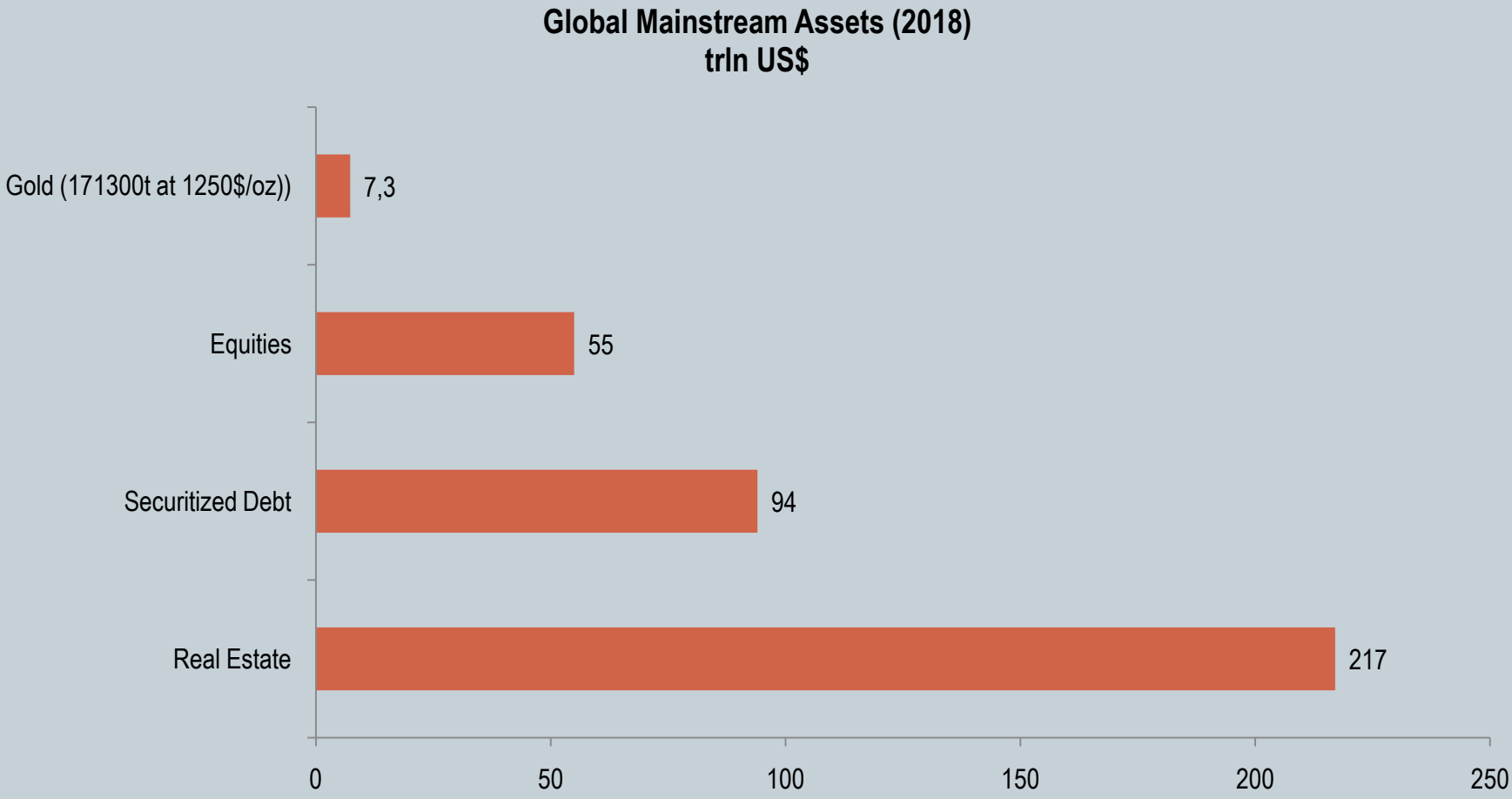
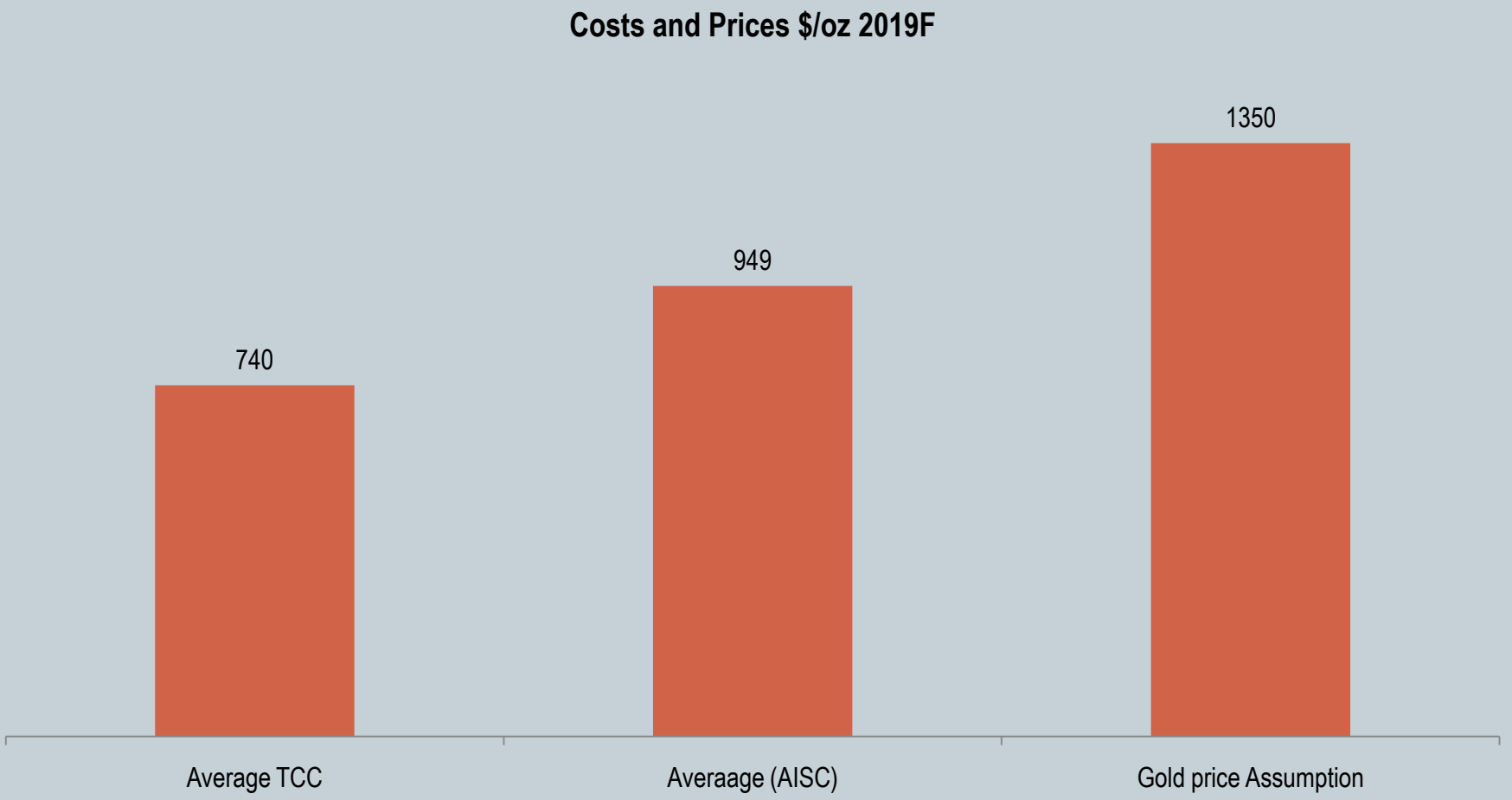
- Platinum Production
- Platinum price
- The Case for Palladium
- Pd Producers
- Palladium Demand
- Pd Price

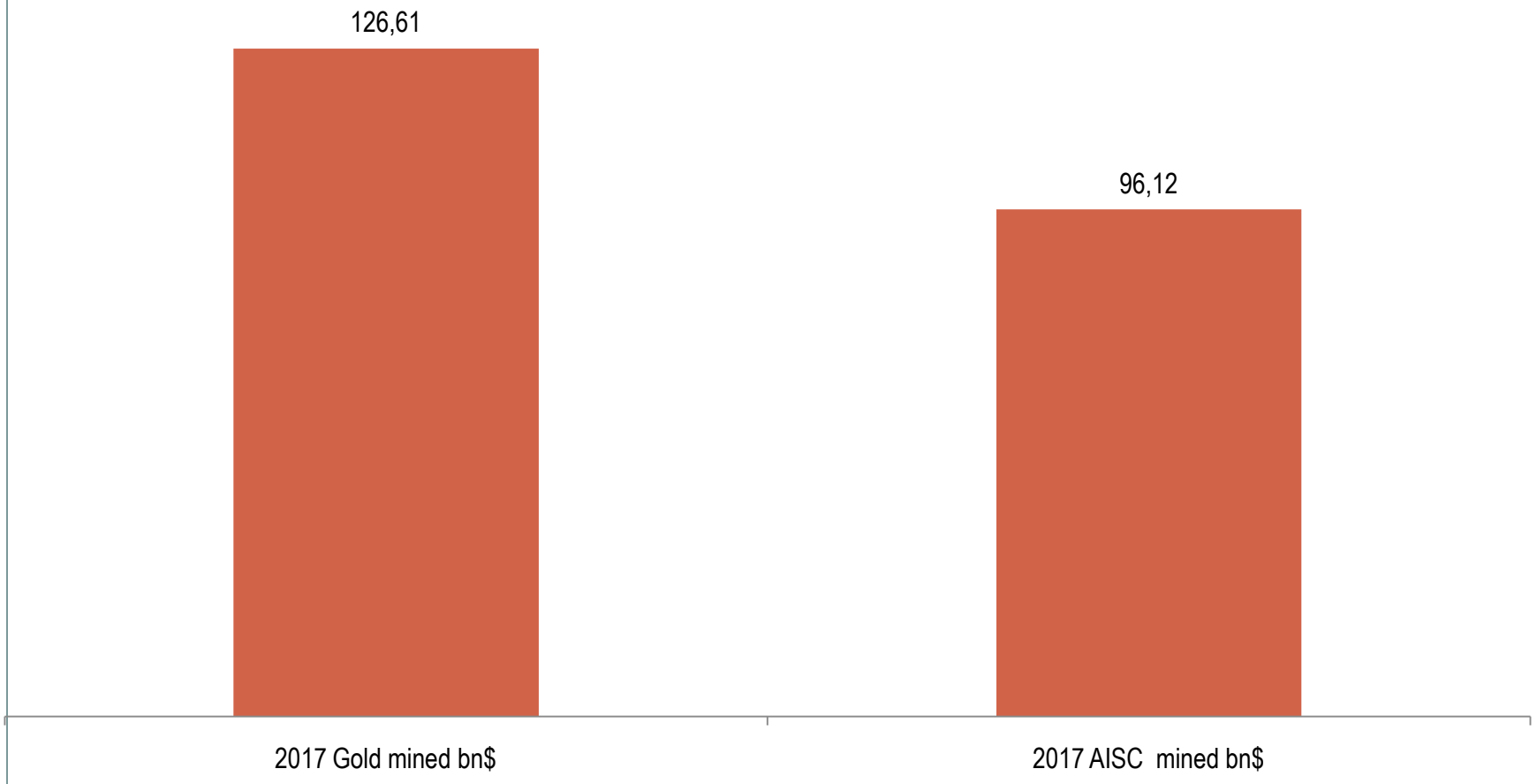
Gold investment is a tiny 1.8% of total financial assets



Cost support for gold price



Value of Gold Mined in 2017 of 3150t at 1250/oz and costs



Historic Gold Price $/oz

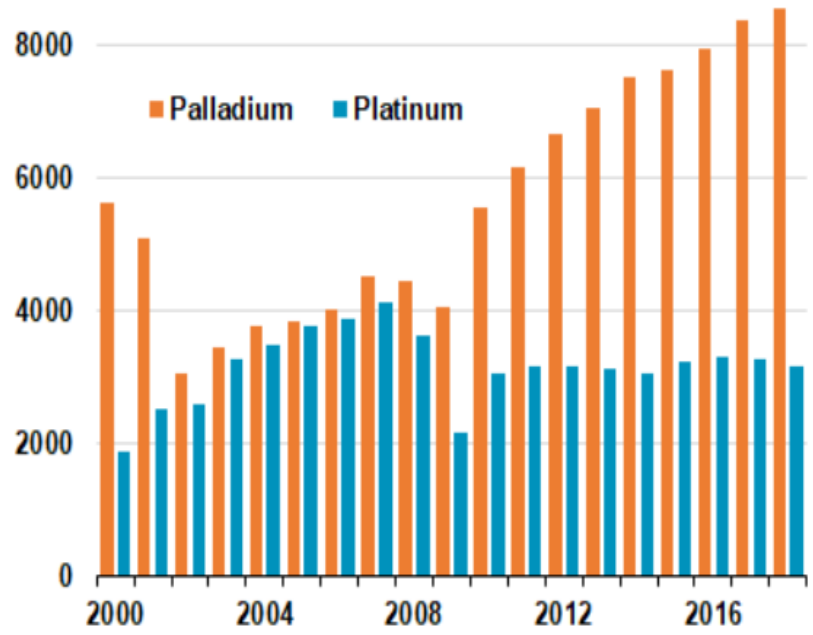
The case for Palladium and Platinum

The tightening of auto emissions standards everywhere in the world is strengthening the case for metals as never before.

In 2017, for the first time in decade, gasoline car sales outpaced the diesel ones in 15 European countries sending Palladium well over its psychological mark of 1000 $ per ounce, as it plays a major role in a catalytic converter of the engine.

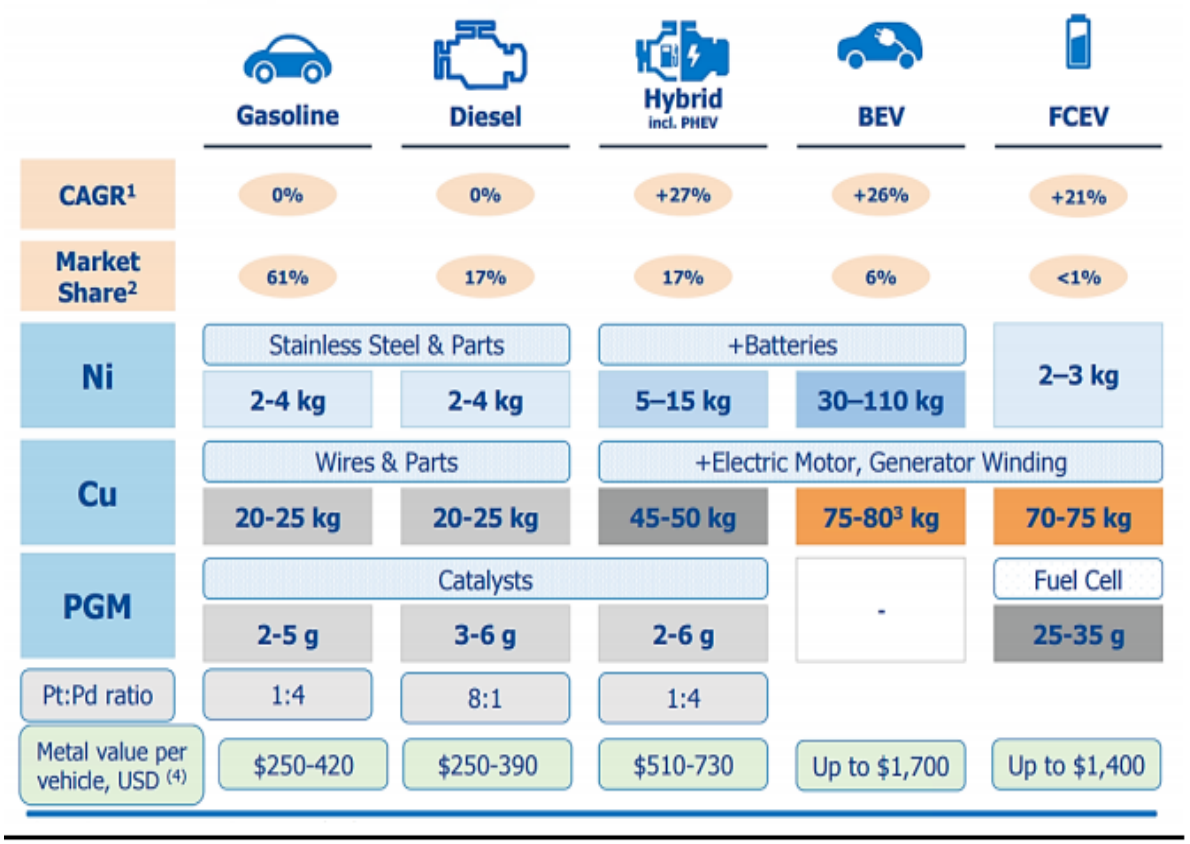
The case of Palladium is clear and positive, but we think that the case for Platinum will also change to positive after the current hiccup as standards for diesel emissions are tightening in major countries including China and substitute for Platinum is non.

- Auto catalyst demand (koz) showing trends in use and substitution



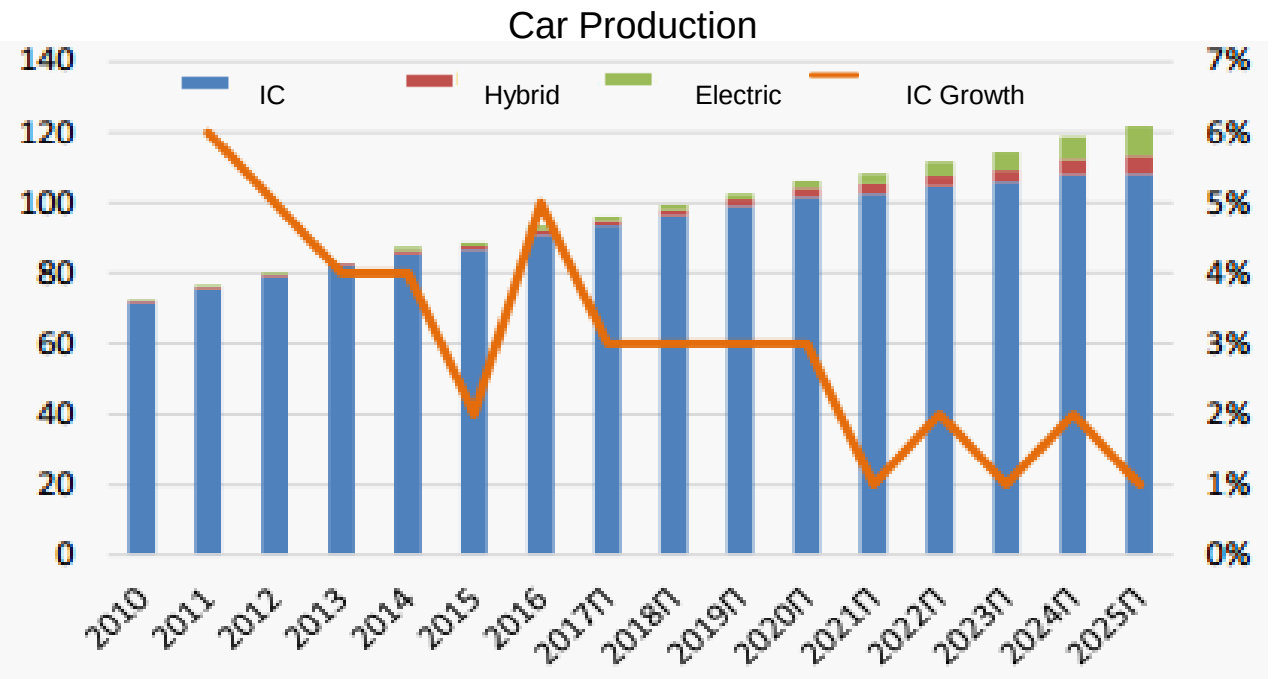
Source: Johnson Matthey

Platinum and Palladium Usage

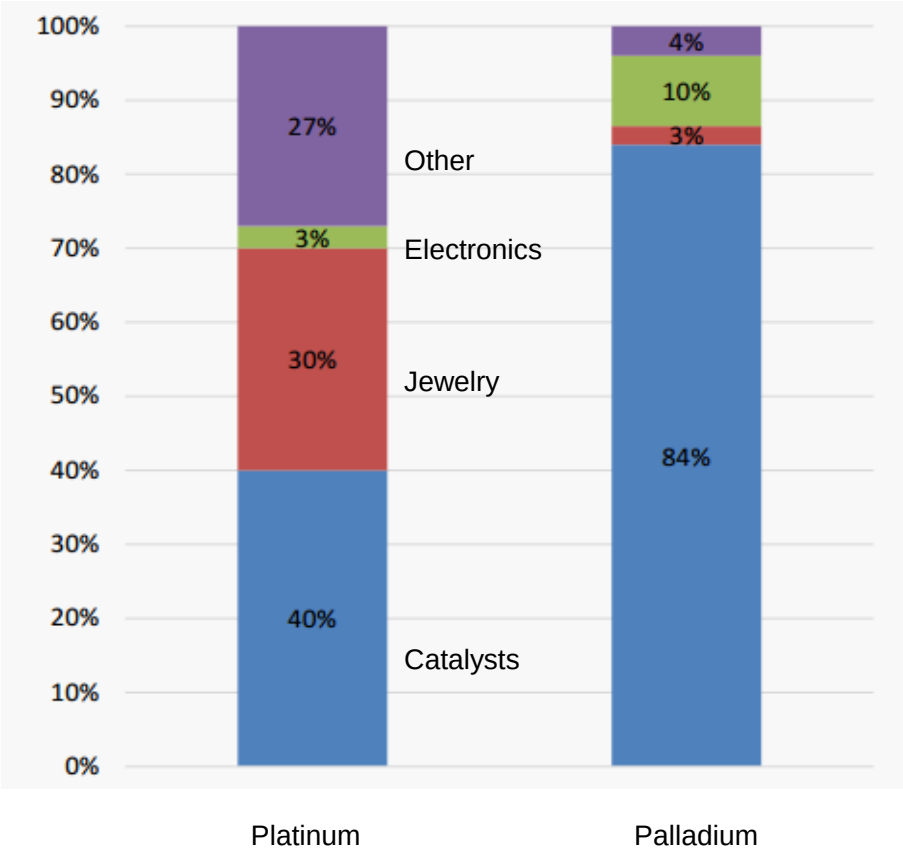


Internal Combustion vs. Hybrids and Electric Vehicles

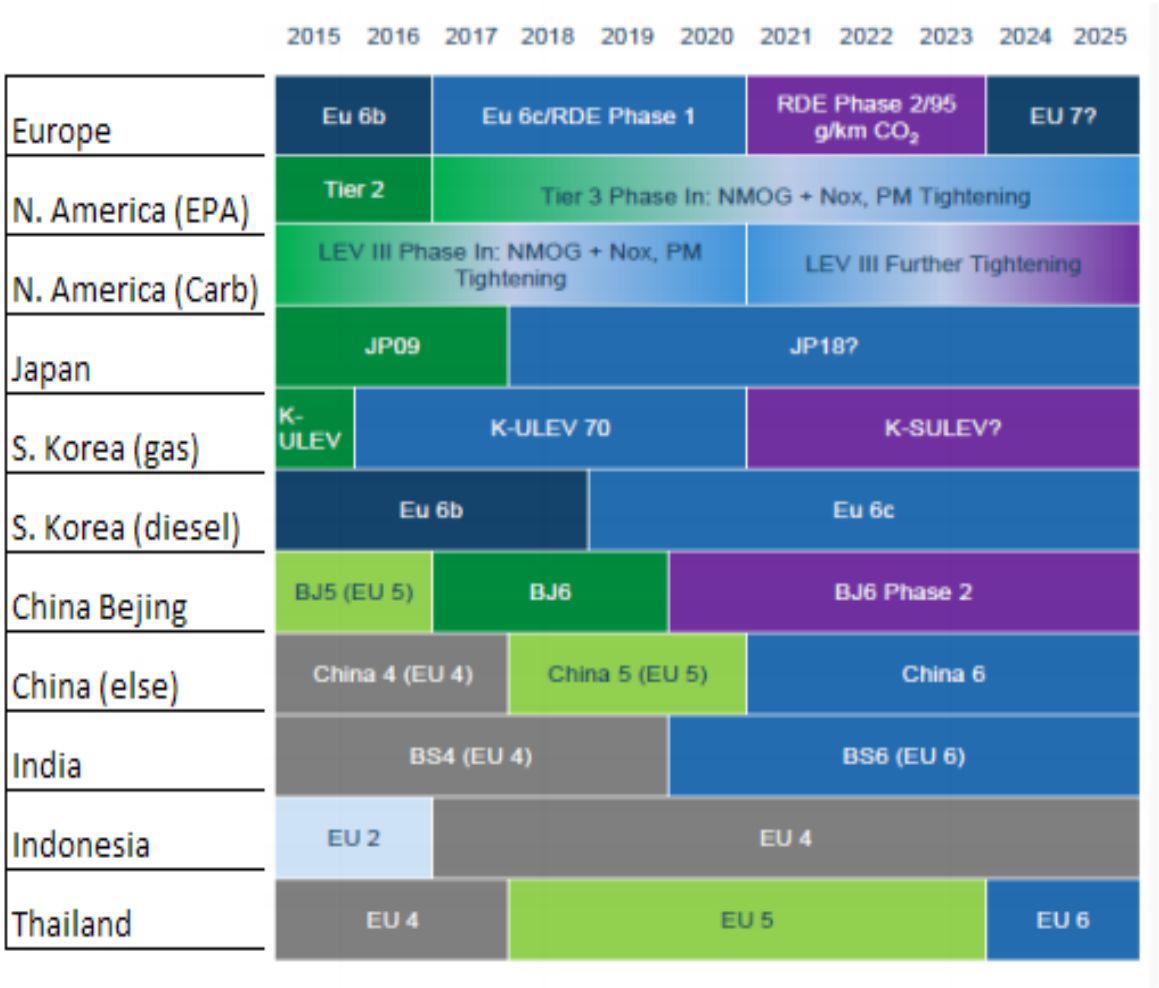
- All the hype around electric vehicles is over reaction.
- IC vehicles - by far prevailing
- Hybrids have the toughest ecological standards and add to Pd, Pt usage



Use of Platinum and Palladium

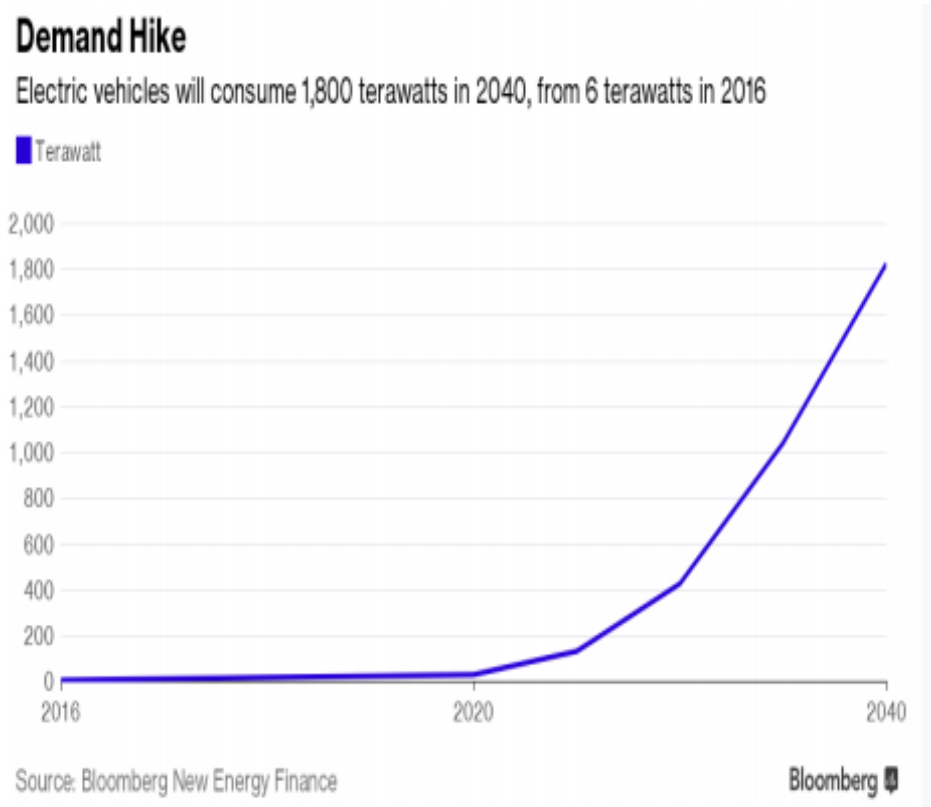


Evolution of Ecological Standards



Probably there is not enough lithium to satisfy energy needs of Electric cars

- Energy demands from EV are humongous



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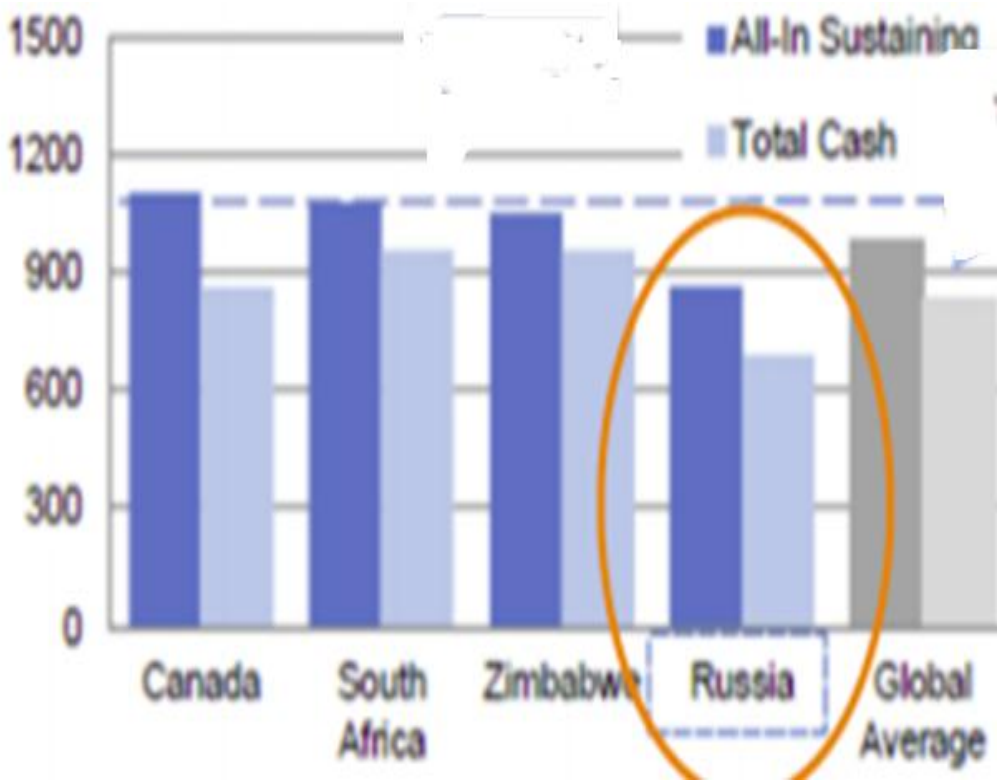
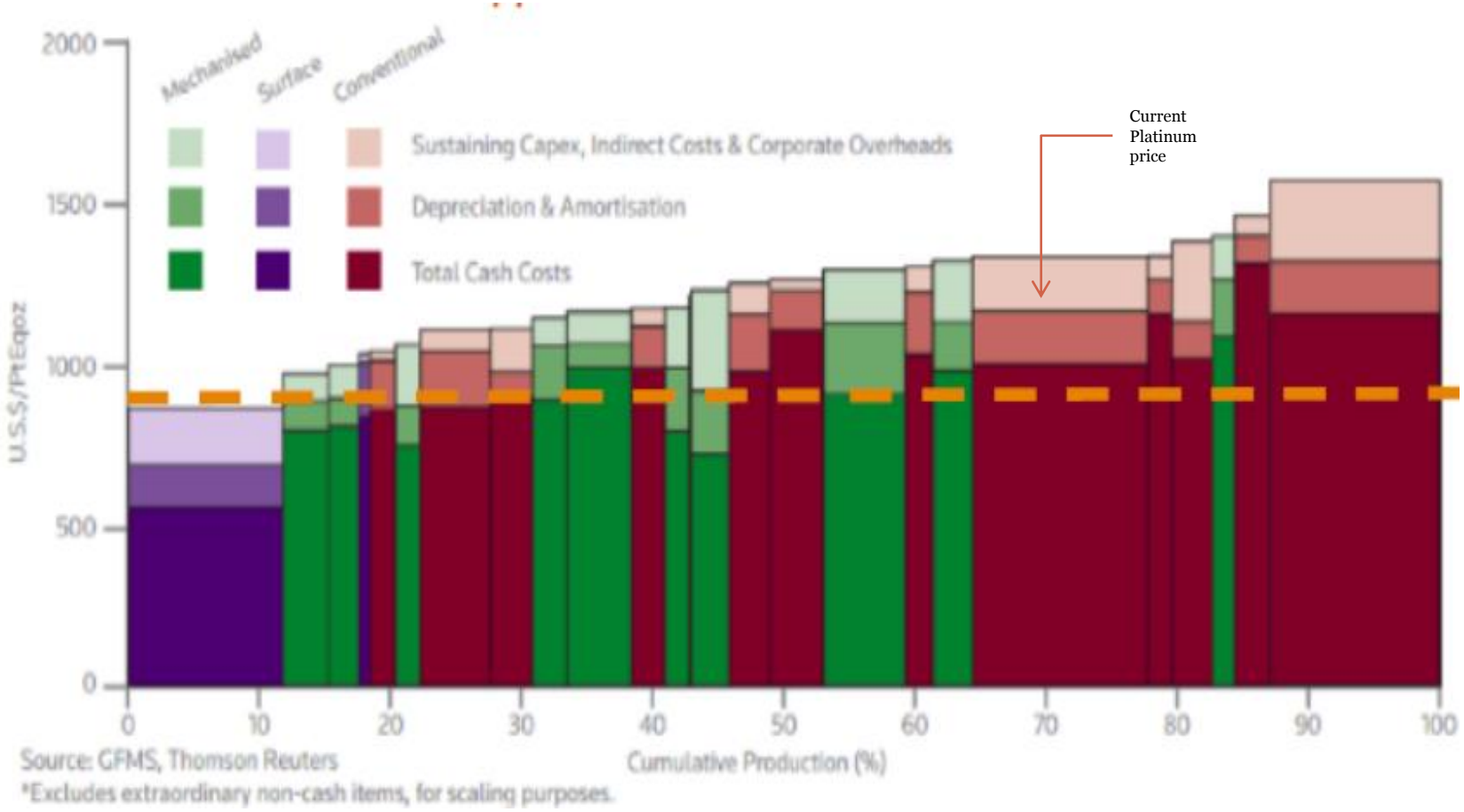


Before Pt Hike most S. African producers had operated at loss



The Case for Platinum

83% of the global Platinum resources are found in South Africa

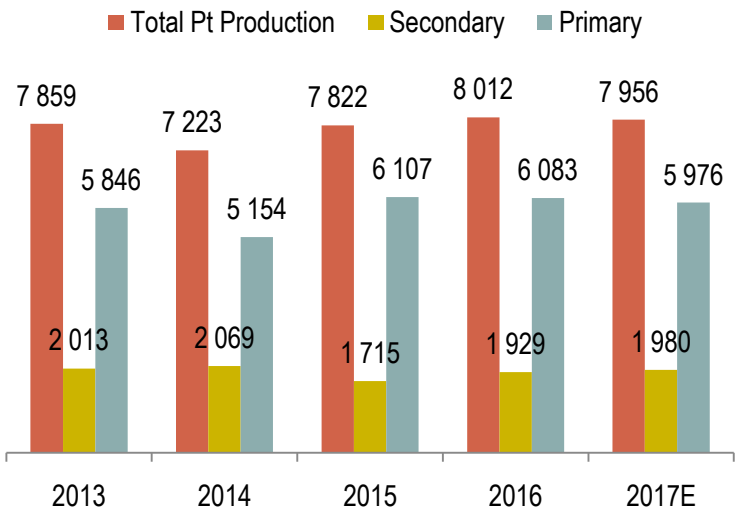
- **Platinum resources**
- In nature, there are primary Platinum or PGM metals deposits which contain mostly platinum group metals, and there are also complex deposits where PGM metals occur as secondary products in relation to other metals, most often nickel or copper.
- The global platinum industry is based on primary PGM deposits.
- The main platinum resources are concentrated in South Africa and make up 83% of the global (1,621 million ounces). Bushveld Igneous Complex located in South Africa is the largest set of PGM deposits in the world.
- Zimbabwe accounts for 5.5% of the world's resources platinum (107.7 million ounces). Great Dyke Complex, located in Zimbabwe - the second largest set of PGM deposit in the world.

Country	Deposit	Owner	Development Stage	Ore Reserves mn t	Platinum content g/t	Reserves of Platinum ml oz
South Africa	Mogalakvena	Anglo American Platinum Ltd.	Active mining	1 417,4	2,76	124,3
South Africa	Marikana	Lonmin Plc (82%), Incw ala Resources Ltd.	Active mining	277,1	4,09	36,5
Russia	Zapolyarnoe branch*	PJSC MMC Norilsk Nickel	Increase capacities	695,1	1,11	24,9
South Africa	Sondereyde	Northam Platinum Ltd.	Increase	135,5	4,47	19,5
South Africa	Rustenburg	Sibanye Gold Ltd.	Active mining	209,5	2,74	18,5
Russia	Norilsk-1 (southern part)	LLC "Russian Platinum"	Feasibility study	612	0,91	17,9
South Africa	Bafokeng-Razimon	Royal Bafokeng Platinum (67%), Anglo American Platinum Ltd. (33%)	Active mining	128,6	4,24	17,5
South Africa	Amandelbut	Anglo American Platinum Ltd.	Active mining	109,7	4,57	16,2
Russia	Maslovskoye	PJSC MMC Norilsk Nickel	Feasibility study	215,0	1,78	12,5
South Africa	Bokoni	Atlatsa Resources (51%), Anglo American Platinum Ltd. (49%)	Increase capacities	83,3	4,43	11,9

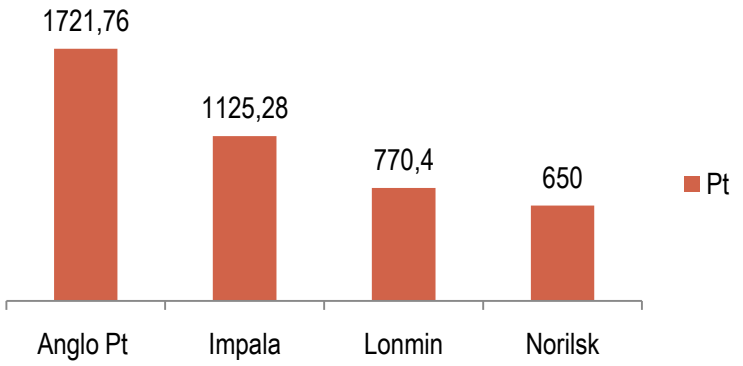
Platinum Production

- Platinum production is divided into primary and secondary. The source of the primary platinum is the extraction and processing of platinum ores. The secondary supply consists of the processing of automotive, jewelry and electrical scrap.
- In 2013–2017 the total supply of platinum was quite volatile and varied in the range from 7,223 to 8,012 thousand ounces. According to consensus, the aggregate supply of platinum will change slightly in 2018 compared to 2017. There will be a slight change in the structure of supply: primary supply will decrease by 1.8%, and secondary supply will increase by 2.6%.
- **Primary Production**
- One of the main factors influencing the formation of the initial supply of platinum is the depletion of deposits in the main producing country - South Africa. Additionally in 2014, the primary supply decreased by 11.8% due to the long strike of workers in South Africa
- The growth of the initial supply in 2015 was associated with the desire of South African manufacturers to return their market share lost in 2014. In addition, in 2015 in South Africa there were no serious and long-lasting interruptions in the supply of electricity, downtime associated with increased danger, social unrest and strikes.
- Against the background of a decrease in platinum prices in 2016, South African manufacturers reduced metal production, which led to a drop in world production by 0.4%
- In 2017, according to experts, Russian platinum supplies will decrease by 7.5% due to lower sales from reserves and weaker production from alluvial deposits. The largest platinum producers in South Africa experienced technical problems at their processing plants, which also had a negative effect on the overall supply of platinum.
- **Secondary Production**
- Secondary offer in 2013–2014 increased primarily due to the increase in the number of vehicles sent for scrap, and the sale of part of the stock by enterprises collecting scrap.

Volatility of supply of Platinum is linked to political and social unrest in South Africa



Key Pt Producers 2018E



Use of Platinum

Pt is mainly used by Consumer Discretionary industries

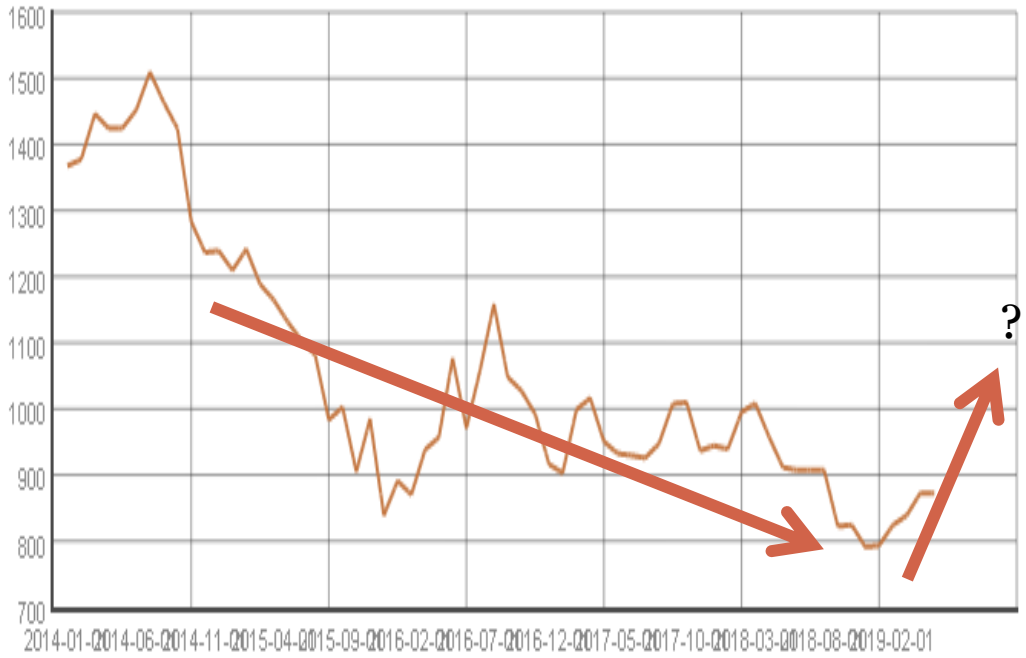
- The main industries-consumers of platinum are automobile industry an and jewelry production. Ironically both are consumer discretionary subindustries. Together these industries account for more than 70% of global demand.
- Pt is mainly used as a catalyst for diesel autos (41% of usage) where production is currently volatile after scandals. But despite the scandals overall demand for Pt as catalyst is expected to post small increases going forward with China the biggest driver of growth.

	2012	2013	2014	2015	2016	2017	CAGR 2013-2017
Autocatalysts	3 158	2 937	3 057	3 228	3 327	3 285	0,8%
Jewelry	2 783	2 984	2 839	2 746	2 412	2 227	-4,4%
Chemical industry	452	522	576	502	527	521	2,9%
Investments	450	871	277	451	620	356	-4,6%
Glass	153	102	143	227	246	306	14,9%
Electronics	176	219	225	228	230	258	7,9%
Medical and Biomedical industry	223	217	214	215	218	220	-0,3%
Petrochemistry	112	146	172	140	176	198	12,1%
Other industry	395	419	434	441	458	475	3,8%
Total	**7 902**	**8 417**	**7 937**	**8 178**	**8 214**	**7 846**	**-0,1%**

Platinum price

- Despite strong fundamental factors (prevalence
- long-term supply shortage and growth in platinum consuming industries, especially production
- Auto catalysts), in December 2016, platinum prices fell to minimum values since 2009.
- From mid 2014 to December 2015 platinum prices fell 41.7% from $ 1,428 per ounce to 833 USD per ounce. This was followed by a correction upward , and prices reached US $ 1,151 per ounce in August 2016.
- This increase due to rising platinum demand from the chemical and automotive industries also supported the price by a small strengthening the national currency of South Africa. However, in December 2016 the price of platinum resumed its decline, down 21.7% to $ 902 US per ounce by the end of December 2016.
- From December 2016 to December In 2017, the platinum price increased by 3.5% to $ 934 per ounce, there were no significant fluctuations in price in 2017.
- In 2018 Pt seen new lows.
- But the future we think will be more supportive of Pt price

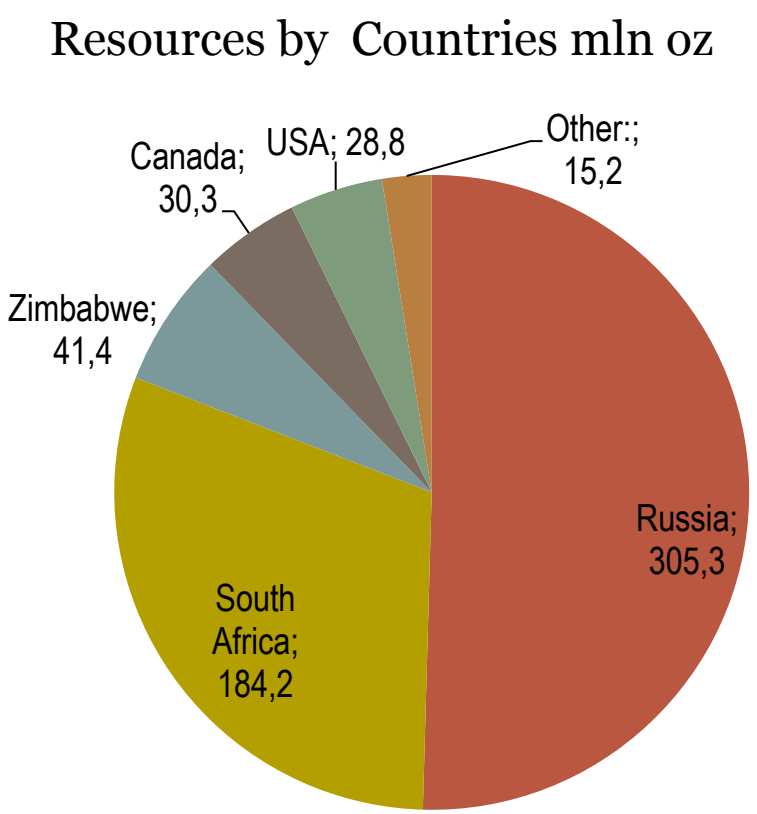
Despite strong fundamental case for Platinum, its price is falling



The Case for Palladium

The richest Palladium deposit is in Zapolyarnoe, Russia

- Russia 49.2% of world palladium resources (305.3 million ounces) located in Russia.
- Zapolyarnoe - the richest complex of palladium deposits 258.7 million ounces.
- South Africa - the country has 29.7% of the world's palladium resources (184.2 million ounces).
- Most of the deposits are of the platinoid type. The Bushveld complex is the largest complex of PGM fields in the world.
- Zimbabwe 6.7% of the world's palladium resources (41.1 million ounces) are in Zimbabwe, which are located in the Great Dyke intrusive massif, the second largest complex of PGM deposits in the world in terms of resources.
- Canada. It has 4.9% of the world's palladium resources (30.3 million ounces). Most of the resources are in the Sudbury Basin in Ontario.



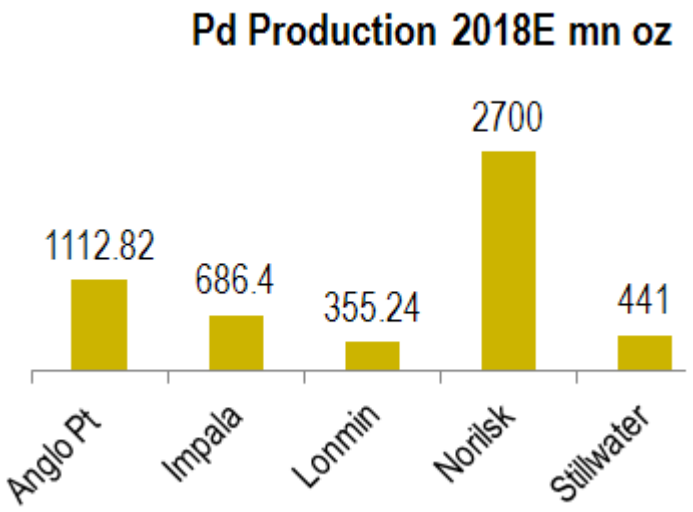
Pd Producers

- Norilsk Nickel is the market leader. The company accounted for 40% of the global primary supply of palladium in 2018. The company operates primarily in the complex copper-nickel deposits in Russia, mining together copper, nickel (second place in the world), platinum, palladium and other PGMs.

- Anglo American Platinum Limited is the second largest player in the market, which in 2018 accounted for 16.6% of the global palladium supply. The company is 100% owner of eight fields of the Bushveld complex in South Africa, and also participates in a number of joint projects in South Africa. Anglo American also owns two fields in Zimbabwe.

- Impala Platinum Holdings Limited occupies 10.1% of the market in terms of palladium production. This vertically integrated company owns four fields in South Africa, the structure of the company also includes the company Zimplats in Zimbabwe.

- Stillwater Mining Co. is an American company, which accounts for 6.4% of the world production of palladium. The company operates in East Boulder and Stillwater fields in the United States. Also Stillwater Mining Co. engaged in the secondary production of platinum and palladium.



Palladium Demand

21 **Palladium is a more efficient alternative to Platinum with regards to auto catalysts**

- More than 95% of palladium demand is provided by industry, primarily by the production of autocatalysts for gasoline cars
- The significant increase in use of Pd is due to the fact that palladium is a more economical alternative to platinum for autocatalysts, especially for gasoline vehicles. In addition, the trend towards stricter exhaust emission standards is finding a place among more and more countries. Developing regions are beginning to join developed countries. This trend has a positive effect on the demand for autocatalysts, which reduce the proportion of toxic elements in exhaust gases. The production of hybrid cars, which are equipped with gasoline engines, is also growing; which increases the demand for palladium.
- The demand for palladium for autocatalysts in 2018 will be relatively evenly distributed across regions of the world. North America, Europe and China account for 21%, 16% and 21% of global demand, respectively. The demand for palladium for autocatalysts has grown in China and North America , the average annual growth rate for 2013-2017 was 10.3% and 3.3%, respectively, which was caused by an increase in car production in China, focused not only on meeting growing domestic demand, but also on exports, as well as on tightening environmental standards in China.

‘OOOOz	2012	2013	2014	2015	2016	2017	CAGR 2013-2017
Autocatalysts	6 673	7 069	7 515	7 622	7 948	8 424	4,8%
Electronics manufacturing	1 190	1 017	970	903	871	853	-6,4%
Dentistry	510	457	464	468	430	407	-4,4%
Chemical industry	524	378	315	451	425	537	0,5%
Jew elry	442	354	272	222	191	180	-16,4%
Investments (negative number means sales of stock)	467	-8	943	-659	-646	-386	-
Other	104	109	111	134	151	137	5,7%
Total	9910	9376	10590	9141	9370	10152	0.5%

Pd Price

22

Palladium price has grown dramatically from 2016 due to automotive emission standards pressures

- Average monthly price for palladium
- increased in 2016 by 55.7% from 496 to
- $ 772 per ounce. The market has experienced an increase in deficit palladium, which is associated with growing demand
- from the automotive industry and shrinking
- production in South Africa and Russia.

- Reduced palladium production Russia due to reconfiguration metallurgical assets of Norilsk Nickel. In 2017, the price for palladium showed stable growth dynamics and by December reached record value of $ 1,061 per ounce, the main driver of growth has become diesel scandal in the USA, in the center which turned out to be German automaker Volkswagen.