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The concept of project value tracking and its application in project planning at Anglo Platinum

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Introduction

Anglo Platinum's long-term strategy has been and continues to be the promotion of the demand for platinum group metals (PGMs) and the expansion of its productive capacity to meet this growing demand, while conducting business in a competitive, cost-efficient and safe manner.

The implementation of this strategy is subject to adjustment in the light of changing market and general economic circumstances. To this end the nature of the Group's resources, in particular the number, variety and output capacity of existing production sites and potential projects available to it, enable it to respond flexibly to any major changes.

In order to assist Anglo Platinum management in the optimal allocation of capital for developing and exploiting the company's mineral resources, the systematic tracking of the business case value of an operation or a project has been implemented.

Valuation modelling methodology at Anglo Platinum

HSF—an overview

The valuation of strategic long-term planning scenarios at Anglo Platinum is conducted, on a discounted cash flow (DCF) basis, using a specific software application — Oracle Hyperion Strategic Finance (HSF).

HSF is used to perform valuations and assess capital investment decisions, and to run, consolidate and produce the Group's long term plan (LTP).

The application has been highly customized to meet company requirements through which formatted technical input data (tons milled, headgrade, plant recoveries, operating expenditure (opex) and capital expenditure (capex)) is coupled with a set of long-term macro economic and planning parameters (rand-US dollar exchange rate, Consumer Price Index excluding interest rates on mortgage bonds (CPIX) percentages, opex and capex escalation percentages, metal prices and process division assumptions) to perform a DCF analysis on a series of calculated annual cash flows.

The modelling starts at an investment centre (IC) level, i.e. reef type per shaft, and is consolidated at shaft, mine and Group level as required. (Marsh *et al.*, 2005.)

Tracking of investment performance

Once the capital investment decision has been made, the business investment performance tracking and monitoring of the approved investment proposal is therefore of crucial

importance for company management, as periodic reviews will allow proactive rather than reactive steps to be taken to address any deviation from the expected business case.

Valuation modelling factors

Discounted cash flow valuation

The generally accepted method of appraising capital investments is through the use of DCF valuation. A variety of DCF techniques exist and use is made of net present value (NPV), internal rate of return (IRR) and economic profit (EP) in Anglo Platinum.

DCF analysis requires consideration of the relevant cash flows that come about as a direct consequence of the proposed capital investment.

Money terms

Considerable confusion arises about money terms. It is, however, a simple case of adjusting for the effect of inflation. A nominal money terms figure contains an inflation component whereas a real money terms figure does not.

It is important that cash flows are initially calculated in nominal money terms, so that taxation can be computed and included, prior to de-escalating to real money terms for discounting purposes.

This is achieved, in the HSF environment, by inputting values in real money terms (regardless of when in the future the income or expense is to occur) and allowing automatic escalation (different rates for revenue, cost and capital) to nominal money terms. The calculated nominal cash flows can then be de-escalated back to real money terms, and finally discounted allowing for a calculation of NPV.

Discount rate

The discount rate or 'hurdle rate' or 'cost of capital' is the rate used to calculate the current value of future cash flows. Anglo Platinum currently applies tiered series of discount rates to cash flows in real money terms, depending on the risk associated with the proposed project, in order to determine the real NPV. This series of tiered rates is consistent with the Anglo American plc policies.

A real discount rate is used because:

- Most investment evaluation assumptions will be developed initially in real money terms, and
- By applying a real discount rate to real cash flows, the risk inherent in nominal money terms valuations (i.e. the mismatch between the inflation rate assumed in the derivation of the discount rate and the inflation rate assumed in the cash flows projections) is avoided.

Global assumptions

Long-term macro economic and planning parameters encompassing assumptions on rand-US dollar exchange rates, CPIX percentages, opex and capex escalation percentages, on and off mine costs, metal prices and process division assumptions, etc., based on the prevailing views of Anglo Platinum and Anglo American plc, are provided, updated and released quarterly by the Strategy Long Term Planning Department. These are termed the global assumptions (GAs).

Long-term planning level categories

The structuring of a 'life of mine' plan or 'mining right plan (MRP)' is illustrated in the Figure 1 reflecting the production profile of an operation.

The MRP for an operation consists of a number of IC models that comprise varying 'levels' of confidence:

Level 1

- Level 1 models are effectively current operations that require only the necessary stay in business capital expenditure for the balance of their life.
- Level 1e models are approved projects in the implementation/execution/ramp-up phase that have all the necessary initial capital expenditure and stay in business capital expenditure for the balance of their life.

Level 2

- Level 2 models are effectively proposed capital investments (or projects) and are divided into three sub-

categories (a, b and c), which are related to the confidence stage that the respective proposed capital investment (or project) has last been reviewed. These sub-categories are governed by a stage-gate review and approval process and comprise:

- Level 2a Feasibility study = +/- 10%
- Level 2b Prefeasibility study = +/- 15%
- Level 2c Conceptual study = +/- 25%
- Capital expenditure would be directly attributable to the proposed capital investment category and would either be an expansion or replacement project in nature.

Level 3

- Level 3 models effectively cover the remaining extent of potentially extractable resource within the area covered by the current MRP
- The level 3 models are at best, scoping studies (not yet a project in the stage-gate review process)
- Capital expenditure by definition would follow the classification methodology as applied to the Level 2 models, with a 'very low' confidence being attached to the capital estimates (> +/- 30%). (Andersen *et al.*, 2005.)

Project pipeline process

The development of an identified opportunity through the various project phases and review stage-gates into an approved capital investment is illustrated in Figure 2, reflecting the project pipeline process.



Figure 1. Mining right plan production profile

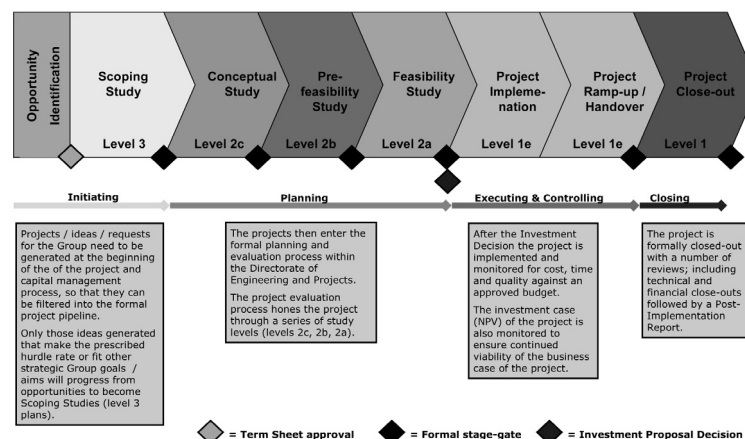


Figure 2. Project pipeline process

Project value tracking analysis

Background

The systematic and periodic tracking of the business case value of an operation or a project has been identified as necessary to assist Anglo Platinum management in the optimal allocation of capital for developing and extracting the company’s mineral resources.

Project value tracking (PVT) analysis takes the form of a waterfall chart, which illustrates the relative importance of various external (environmental variables) and internal (management levers) factors that have caused the NPV to change since the original view baseline model. Figure 3 illustrates a typical waterfall chart output that is generated.

Conducting modelling on an incremental stand-alone basis, a project once approved has an original view of how that investment proposal of the project is expected to perform over time. At regular intervals it is therefore possible to compare the present perspective of the project against this original view over the same timeline. The term present perspective refers to the actuals that have occurred to date plus the current view of the future.

Project value tracking - the HSF solution

Objective

The objectives of compiling a ‘waterfall chart’ in HSF were:

- To produce an incremental variance (or waterfall) NPV analysis between the two points (illustrated as black bars in Figure 3) of the present perspective of a project and the original view over the same project life timeline,
- To utilize existing Anglo Platinum HSF template models in a seamless and easy-to-use system that produces a waterfall chart analysis automatically
- To replace a manual process of incrementally moving groups of data from one model to the other and documenting the NPV change and then displaying this information in an external Excel waterfall chart.

Waterfall chart methodology using HSF

The waterfall chart solution uses existing HSF model templates and is illustrated in Figure 4.

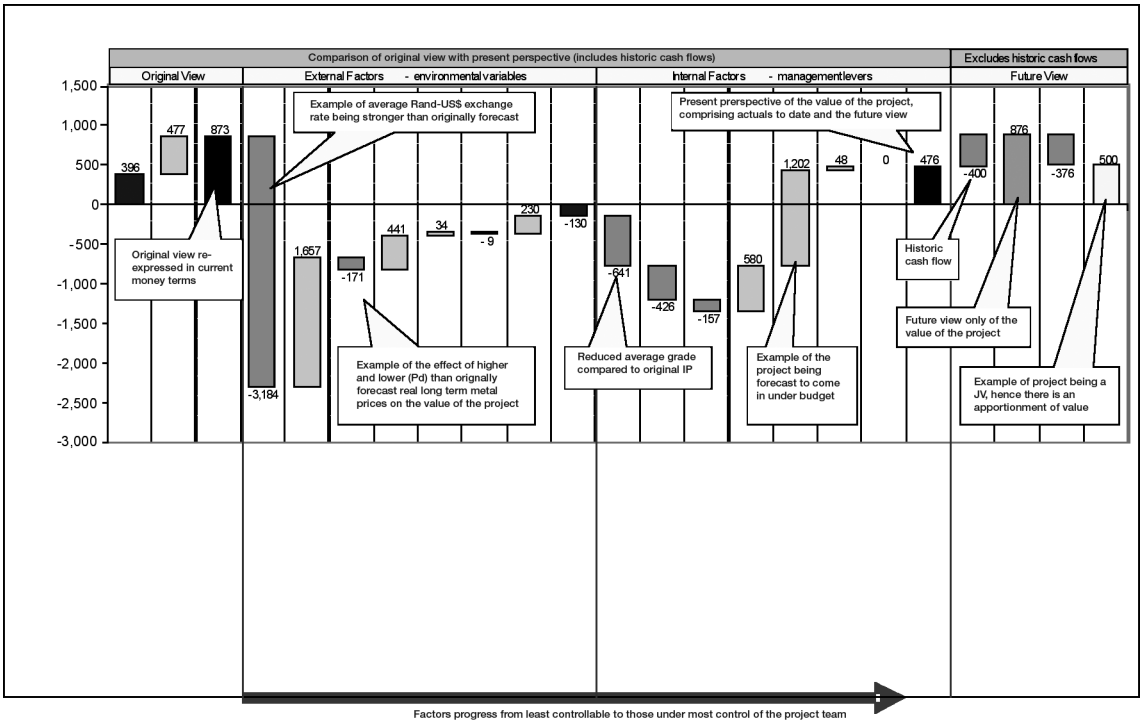


Figure 3. Typical waterfall chart output

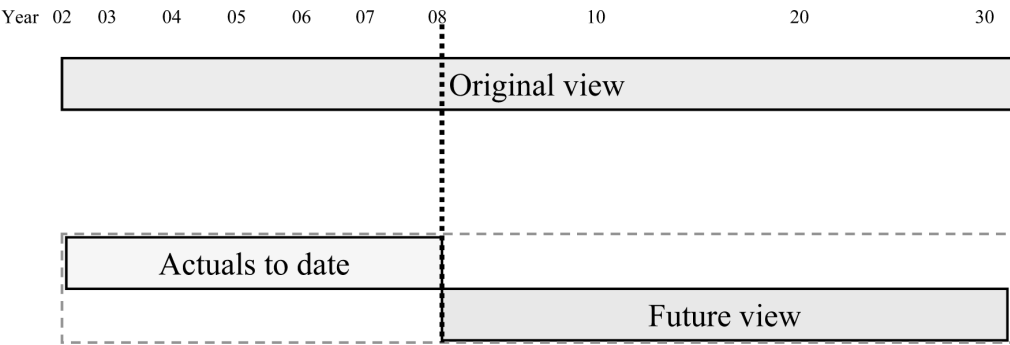


Figure 4. HSF model methodology

The waterfall chart comparison is conducted as follows:

A comparison is made up of three underlying HSF IC models:

- The original view of the project model
- The actuals to date for the project model
- The future view of the project model.

The money terms of the underlying models are as follows:

- The original view model is in original real money terms
- The actuals to date model is in nominal money terms
- The future view model is in current real money terms.

These models then have their data entered into two separate scenarios in another HSF model, which has been custom made for the purpose, the waterfall model.

Using the consolidator function in this model:

- The original view model data is entered into one scenario, named original view (green rectangular block in Figure 5)
- The actuals to date and the future view models are combined (bolted together), and entered into the other scenario, named present perspective (blue trapezoidal block, light yellow rectangular sub-portion block in Figure 5).

Next, the present perspective data is restated back to the same money terms as the data of the original view model so that a comparison in the same money terms is possible. This is achieved by utilizing a money terms converter (MTC) sub-program within waterfall model (blue trapezoidal block, dark yellow rectangular sub portion block in Figure 5).

The waterfall model then iterates the changes between the two scenarios in the steps outlined in Figure 6 using HSF's combined scenarios feature in original real money terms.

This is done by each series of data in the present perspective that represents a factor/bar on the waterfall chart being inserted one by one into the original view model overwriting the original forecast assumptions; with the model being calculated at each step to understand the effect on the NPV of the project.

The model then re-expresses the incremental NPVs for each step in current real money terms and produces a customized waterfall chart, where green bars highlight a positive impact on NPV and red bars illustrate a negative impact.

The waterfall chart therefore shows the effect of:

- The re-expression of the original view of the project into current real money terms
- The iterated NPV steps to arrive at the present perspective of the project in current real money terms
- The effect of the including and excluding historical cash flows on the value of the project, i.e. a comparison of project value between the present perspective and the future view, both in current real money terms.

Figure 5 illustrates how the PVT waterfall model achieves this comparison.

Suggested order in which adjustments conducted

The general principle applied for presentation purposes is that the original view baseline model NPV is adjusted and re-expressed in the same terms as the current money terms of the present perspective of the operation or project, i.e. a project that was approved in 2002 would have its NPV re-expressed by the nominal weighted average cost of capital (WACC%) to 2008 money terms so that it could be compared to the present perspective of the project.

The baseline against which the NPV is tracked is:

- Operations — the last signed-off long term plan (LTP) over the operation's mining right area
- Approved projects — the original investment proposal (IP) or latest signed-off change of scope
- Unapproved projects — the last signed-off stage-gate study work, feasibility (level 2a), prefeasibility (level 2b), and conceptual (level 2c) used to obtain funding for the project.

Then adjustments are made, first to those factors beyond the control of the operation or project team (external factors — environmental variables), and then to those factors within the control of the team (internal factors — management levers). Within these broad divisions, the degree to which the factor can be influenced should decide the order in which the waterfall chart is constructed.

The ownership structure of the project (e.g. joint venture (JV) involvement) or any other value issue that needs emphasis is addressed as the final item on the waterfall chart. The order in which the changes are made at present within Anglo Platinum is summarized in Figure 6.

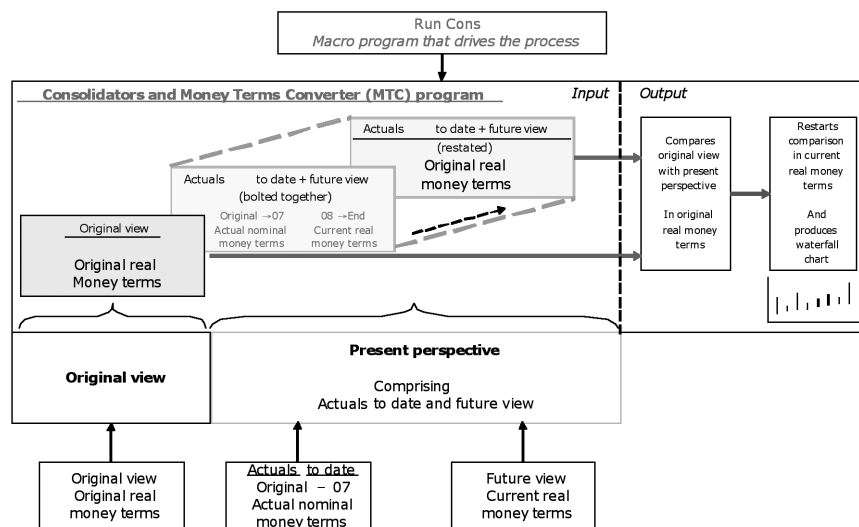


Figure 5. Schematic representation of the waterfall chart methodology in HSF

Step	Description	Comment
Original view (in original money terms)		
0	Original Investment Proposal Or latest Change of Scope	Original money terms & discount date
0	Money terms adjustment	Escalation by CPIX% and appropriate mid-year discount rate for the project to current money terms
0	Re-expressed Investment Proposal Or Latest Change of Scope	Current money terms & discount date of present perspective of the model
Original view (in current money terms)		
Step	Description	Comment
External factors		
1	Rand-US dollar exchange rate	Rand-US\$
2	Platinum price	Pt (US\$/oz)
3	Palladium price	Pd (US\$/oz)
4	Rhodium, other PGM's & gold prices	Rh, Ir, Ru, & Au prices (US\$/oz)
5	Base Metal prices	Ni, Cu & Co prices (US\$/lb)
6	Other economic factors	Royalties, working capital, commissions & discounts, taxation & capitalised interest effects, % sold of production, carbon emission cost effect
7	Process operations	Off-mine cash costs – smelting, BMR & PMR refining & transporting costs, process recoveries & pipelines, cost of third party concentrate purchase (if applicable)
Net impact of external factors only		
Step	Description	Comment
Internal factors		
8	Ore reserve	Headgrade & prill split
9	Mining operation	Ore tons milled throughput & timing
10	Concentrator operation	Concentrator recoveries & mass pull
11	On-mine cash operating costs	On-mine cash costs – shafthead, concentrator & indirect, each broken up into labour, stores, contractors, utilities & sundries
12	Initial Capex	Initial capex for major projects (if applicable)
13	Stay in business Capex	Stay in business capex
14	Other factors	Any other changes not covered (if applicable)
Present perspective - net impact of all factors (in current money terms)		
Step	Description	Comment
Future view (in current money terms)		
15	Exclusion of historic cash flow	Removal of historic cash flow leaves current forward looking cash flow only
16	Future view	Aligns operation or project with LTP and reflects future view on a forward looking basis in current money terms
Other value issues		
17	Partner's share	JV impact on value to Partner (if applicable)
17	Anglo Platinum share	JV impact on value to Anglo Platinum (if applicable)

Figure 6. Project value tracking analysis—description of waterfall chart components

Suggested procedure for restating the original view baseline model

Original view baseline model

The original investment proposal (or other published document chosen as the baseline such as a change of scope) will have its value expressed in the original money terms and discount date that were applicable at the time of approval or sign-off.

Adjustment methodology

The initial step is to restate this models value in the same current money terms as the present perspective model.

This is achieved by escalating the original view baseline model NPV by the nominal WACC% to reflect the change in the time value of the NPV, which is compounded annually and equivalent to:

$((\text{actual CPIX}\%) \times (\text{required company discount rate}))^n$ years

Current valuation models use varying discount rates depending on the type of operation or project.

Re-expressed original view baseline model

Now that the original view baseline model has been re-expressed in the same current money terms and to the same discount date as the present perspective model, the process of changing the external and internal factors by incremental steps can proceed (step 0).

Suggested procedure for external factors

Rand-US dollar exchange rate

The first GA to change is the rand-US dollar exchange rate (step 1).

Platinum group metal (PGM) prices

Second, PGM prices are brought into line with current GAs. This should be done in three steps: individually for platinum and palladium; then for the rhodium, other PGMs (iridium and ruthenium) and gold (steps 2,3,4).

Base metal (BM) prices

BM prices (nickel, copper and cobalt) are dealt with in the same way, as a single step (step 5).

Other economic factors

The step of other economic factors is dealt with as one step. It comprises: royalties, changes in working capital, changes in commissions and discounts, taxation and capitalised interest effects, percentage of metal sold of production, and carbon emission cost effect (step 6).

Process division operations

Although not strictly an external factor, off-mine elements such as: smelting, base metal refinery (BMR) and precious metal refinery (PMR), and ore and concentrate transport costs, together with smelting and refinery recoveries and

pipelines, and cost of third party concentrate purchase (if applicable) are assumed to be largely beyond the control of the operational or project team. Therefore, they can usefully be illustrated at this point. All off-mine factors are changed as a single step (step 7).

Once this adjustment is complete, the waterfall model comparison should fully reflect present perspective GAs and off-mine elements. The NPV of the project at this stage therefore reflects the impact of all of the external factors.

Suggested procedure for internal factors

Internal (management levers) specific factors are now considered, they are defined as the on-mine elements contained in the company's HSF modelling input sheets. The order of substitution of the factors would be as follows:

Ore reserve

This factor reflects any differences between PGM and BM headgrades (quality of the ore reserve). Prill split changes should also be considered at this point due to PGMs poly-metallic nature (step 8).

Mining operation

The mining production (quantity produced from the ore reserve) step maybe incorporate in two stages in order to identify:

- Any timing delay effects, and/or
- Change of scale of operational output in terms of tonnage.

For example, changes of a project from 250 kilotons per month in the original view model to the present perspective of 300 kilotons per month, with a two-year delay to first production (step 9).

Concentrator operation

Any concentrator recovery and mass pull changes, noting that there might be differences between the PGMs and BMs, are then considered (step 10).

On-mine cash operating costs

On-mine cash operating costs, which are divided up into

shafthead, concentrator and central services (or indirect) costs, are examined next (step 11).

Capital costs

Anglo Platinum Limited has two types of capital expenditure: initial capex for major projects and stay in business (or on-going) capex, which is applicable to both existing operations and proposed major projects. See Figure 7 below. This section may therefore be made up of two steps:

- Initial capex will be applicable only if a major project (either approved or in a study phase) is being examined and compared. The two categories of major project are expansion or replacement. An existing (level 1) operation will not have any initial project capex associated with it (step 12)
- Stay in business capital will be applicable to both a major project (either approved or in a study phase) and an existing (level 1) operation. It is the capital expenditure required to maintain the life of existing assets without materially increasing capacity. The categories of stay in business capital expenditure are replacement of specific equipment, business improvements, risk (safety, legislative, and business), ore reserve development and shared infrastructure (specific to area within an operation, operation wide, and external to operations) (step 13).

Other factors

If in a particular instance a change has occurred that is not covered by any of the above categories, then it should be evaluated under the other factors category. An explanatory note should be included to describe the change (step 14).

Once this adjustment has been made, the cumulative NPV result of all of these incremental steps gives the total NPV variance (either positively or negatively) from the original view baseline model to the present perspective model, both being in current real money terms and including all historical cash flows, enabling a valid business investment performance comparison against that of the original investment decision to be made.

		Projects Capital Categories		Stay in Business Capital Categories								
		Expansion Production Increases Capacity	Replacement Maintain Production Capacity	Replacement of equipment (Re)	Business Improvement (BI)	Risk			Ore Reserve Development (ORE)	Shared Infrastructure (SI) - Any capital not directly related to a particular project		
						Safety (RS)	Legislation (RL)	Business (RB)		Specific to area within Op (SIS)	Operation wide (SIW)	External to Op (SIE)
Responsibility for generating	AMS Projects	AMS Projects	Mine / Plant / SPM&EE (for existing) / AMS Projects (for new)	Mine / Plant / SPM&EE / AMS Projects as required	Mine / Plant / SPM&EE			Mine / SPM&EE / AMS Projects as required	Mine / Plant / SPM&EE / AMS Projects as required			
	MTS / Process / Operations / SLTP / Project Review Team	MTS / Process / Operations / SLTP / Project Review Team	MTS / Process / Operations / SPM&EE / Project Review Team	Operations / SPM&EE / SLTP	Operations / SPM&EE / SLTP			MTS / Operations / SPM&EE / SLTP	Operations / SPM&EE / SLTP			

Figure 7. Project capital categories

Suggested procedure for obtaining future view

Exclusion of historic cash flows

Eliminating historical cash flows, which include sunk capital expenditure, operating costs and any revenues derived from historical production, plus tax effects (if applicable), will leave only the current forward looking cash flow of the project (step 15).

Future view

After the historic cash flows have been excluded, the end point will now be aligned with the latest forward looking version in the Group's LTP, and reflects the future view models NPV of the operation or project (step 16).

Other value issues

One or more additional bars maybe needed to illustrate the ownership structure of the project, e.g. if it is associated with a JV (partner's share and Anglo Platinum's share of value of the JV) or any other value issue that needs to be emphasised (step 17).

Conclusion

The ability to develop a continuous feedback loop of business investment performance relative to original investment criteria (technical, capital and otherwise) is essential if investment decision making and value maximization is to be improved continuously.

Value tracking of capital investment decisions is thus critical for Group value optimization and capital prioritization in a large multi-investment mining Group such as Anglo Platinum.

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Having joined Anglo Platinum in late 2002, Justin currently works as a Senior Planning Analyst in the company's Strategic Long Term Planning department, focusing on the overall fit and viability of the various feasibility studies and projects that the company is undertaking.

He grew up in Sussex, England and obtained a B.Eng (Hons) in Mining Engineering from the Camborne School of Mines in 1987. The following year he came to South Africa, to work for Impala Platinum in Rustenburg, where he spent time in production mining and projects. During this period he gained his mine managers certificate of competence (metalliferous) and was a member of the mines' proto team.

In 1993 he joined Ensign-Bickford South Africa, a joint venture between Sasol and Ensign-Bickford of America, as an explosive engineer. The position gave Justin exposure to a vast variety of different mining methods both underground and on surface.

Justin continued with his studying in 1995 completing an M.B.A. at the Graduate School of Business in Cape Town. After which he joined Standard Corporate and Merchant Bank (SCMB) as an asset manager, researching mining companies.

In 1998 he left SCMB and joined his wife, Kim, who runs a very successful corporate clothing business. His job was to expand the company into manufacturing its own garments.

Then in 2000 SCMB re-hired Justin this time in the stock-brokering arm of the bank as a platinum and diamond analyst. He gained a Financial Mail top ten rating in the platinum sector in 2002.

Justin has travelled widely throughout the world, and has even hiked the Inca trail in Peru. He has a brown belt in Judo and enjoys playing squash. Justin and Kim have two young children, Luke and Jordan, who give them the pleasure of many sleepless nights.

