Teach yourself how to build a Business Case for industry

including Mining

1c Hands On Modelling – Three worksheet layouts

Etosha, Namibia

Spend only a few seconds on each page

This website may contain errors so always check your own work and have it audited by a competent person. This website has personal opinions.

Etosha, Namibia same waterhole an hour later

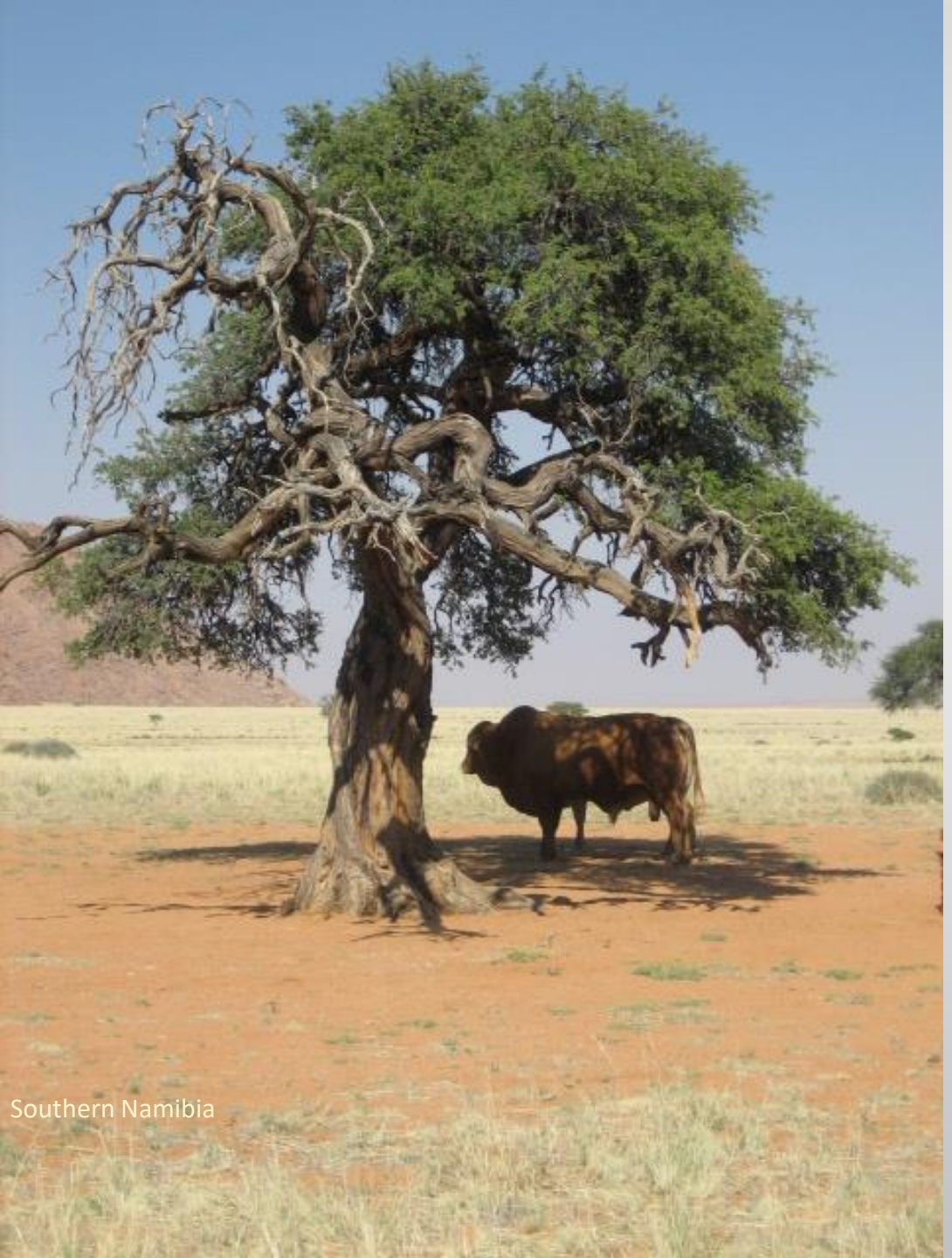
The purpose of this module is to illustrate **the three types of architecture** that can be used to construct a business model. (when doing hands-on modelling)

Level 3: Decision making

Level 2: Evaluating the business/project

Level 1: Hands-on economic modelling

Jogging at Sossusvlei, western Namibia



Southern Namibia

Many experienced evaluation specialists have found:

- that ‘standard models’, ‘template models’ or ‘black box models’, where you have a predetermined form and fill in the blank cells, are very dangerous and should be avoided.

- Instead, you need to create a new tailored model for each project/business/acquisition

A. Three typical layouts

One of the following can be used as layouts for most tasks:

i. **A Simple Assessment**
ii. **Comparing Alternatives**
iii. **One long, detailed, complex model**

Kolmanskop exhausted diamond sands, Southern Namibia

Layout i: Simple Assessments

- day-to-day evaluations and
- concept studies

probably need a simple business model like this →

Walvis Bay dunes, west coast Namibia

A Simple Assessment											
NPV	A$ millions real	26									
IRR	Real	16.8%									
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 1: Production and Revenue											
Production											
3 Nov 2020 Michel Basil: Email of production throughputs and output of saleable products											
Waste removed	000 tonnes	11,000		3,000	3,000	2,500	1,500	1,000	0		
Ore mined	000 tonnes	4,300			800	1,000	1,000	1,000	500		
Head Grade - acid soluble copper	% Cu	0			2.1%	2.1%	2.1%	2.1%	2.1%		
Contained acid soluble copper	000 tonnes	90	0	0	17	21	21	21	11	0	0
Recovery of soluble copper in production, leaching and SX-EW	% Cu	90%			90%	90%	90%	90%	90%		
Output and Sales of Cathode Copper	000 tonnes	81	0	0	15	19	19	19	10	0	0
Sales and Revenue											
5 Nov 2020 Peter Murphy: Comparison of forecast and budget copper prices											
Copper price - SX-EW cathode	US$/t	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500	8,500
Output and Sales of Cathode Copper	US$ Millions real	138	0	0	100	125	125	125	63	0	0
Forex A$	A$1.00 = US$...		0.80	0.80	0.80	0.80	0.80	0.80	0.80		
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 2: Capital Costs											
Major Development Capex											
3 Dec 2020 2016 Carlo Embre: Email - initial capex estimates											
Major Development Capex	A$ millions real	123	25	98							
Ongoing Capex											
5 Dec 2020 2016 Carlo Embre: Email - on-going capex @ 5% of total initial capex											
ongoing capex	% of initial capex		5%	5%	5%	5%	5%	5%	5%	5%	5%
ongoing capex	A$ millions real	31	0	0	6	6	6	6	6	0	0
Cashstream 2: Capital Costs	A$ millions real	154	25	98	6	6	6	6	6	0	0
Tax deductions for Capital Expenditure											
This assessment: -											
15Nov 2020 G Rose: For this business, tax legislation reads that the bulk of the capex is deducted over 5 years straight line. So in the calculations below the diminishing value rate is 100%/5 years *150% = 30%											
24Nov 2020 G Rose: And the tax legislation is that deductions for new equipment start with commercial production, with capex being deducted fully in the year in which it is spent.											
Look inside this cell to see the logic!											
Tax Deduction for Capital Expenditure	% diminishing value		30%	30%	30%	30%	30%	30%	30%	30%	30%
23Nov20 G Rose, Accountant emailed that $7M has been spent on the project (and is capitalised in the accounts) but only $2M remains unclaimed deductions in the tax returns.											
Undeducted capex - opening balance	A$ millions real		2	27	125	92	69	52	41	0	0
Undeducted capex - added to pool	A$ millions real	154	25	98	6	6	6	6	6	0	0
Undeducted capex - in pool	A$ millions real		27	125	131	98	75	58	47	0	0
Undeducted capex - available for deduction	A$ millions real	609	0	0	131	98	75	58	47	0	0
23Nov20 G Rose: Unclaimed tax deductions can be claimed in the final year of use.											
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0
Undeducted capex - closing balance	A$ millions real		27	125	92	69	52	41	0	0	0
Check if deductions = capex		OK									
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 3: Operating Costs											
3 Nov 2020 Carlos Bas: email outlined operating costs											
variable opex											
waste cost - variable	A$ Real/ tonne waste		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
waste cost	A$ millions real	28	0.0	7.5	7.5	6.3	3.8	2.5	0.0	0.0	0.0
ore cost - variable	A$ Real/ tonne ore		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
ore cost	A$ millions real	13	0.0	0.0	2.4	3.0	3.0	3.0	1.5	0.0	0.0
processing cost - variable	A$ Real/ tonne ore		35	35	35	35	35	35	35	35	35
processing cost	A$ millions real	151	0.0	0.0	28.0	35.0	35.0	35.0	17.5	0.0	0.0
SX-EW cost - variable	A$ Real/ tonne cathode		950	950	950	950	950	950	950	950	950
SX-EW cost	A$ millions real	95	0.0	0.0	9.5	11.9	11.9	18.0	9.0	0.0	0.0
fixed opex											
supervision and technical	A$ M/annum Real		2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2
General & Admin	A$ M/annum Real		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
fixed opex	A$ millions real	41	0	0	8	8	8	8	8	0	0
private royalty											
private royalty rate	% of sales revenue		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
private royalty	A$ millions real	17	0	0	3	4	4	4	2	0	0
rehab											
rehabilitation	A$ Real/ tonne waste & ore		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
rehabilitation	A$ millions real	15	0	3	4	4	3	2	1	0	0
closure											
closure	A$ millions real				45	45	45	45	45	45	45
closure	A$ millions real	45			0	0	0	0	0	45	0
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0
opex per ore (incl closure)	A$/tonne ore	90	0	0	84	78	74	73	77	0	0
opex per tonne final product (incl closure)	A$/tonne cathode	4,752	0	0	4,457	4,117	3,932	3,839	4,088	0	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 4: Taxes											
Government Royalties											
21Dec20 G Rose: The government royalty rate is 6% of gross revenue.											
government royalty rate	% of sales revenue		6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0
Income tax											
21Dec14 G Rose: The company income tax rate is 30% and the company expects to be paying income tax in the year in which it can be used immediately.											
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0
less											
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0
Assessable income	A$ millions real	90	0	-11	11	40	50	57	-12	-45	0
Company Income Tax Rate	% of assessable income		30%	30%	30%	30%	30%	30%	30%	30%	30%
Income Tax	A$ millions real	27	0	-3	3	12	15	17	-4	-14	0
Cashstream 4: Taxes	A$ millions real	67	0	-3	11	21	24	26	1	-14	0
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashflow and NPV											
Cashflows											
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0
Cashstream 2: Capital Costs	A$ millions real	154	25	98	6	6	6	6	6	0	0
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0
Cashstream 4: Taxes	A$ millions real	67	0	-3	11	21	24	26	1	-14	0
Net Cashflow	A$ millions real	65	-25	-94	41	26	33	31	31	-31	0
IRR	Real	16.8%									
Discounting											
7Jul20 F Green email: discount rate for investment in gold industry is 8% Real.											
Discount Rate	% Real		8%	8%	8%	8%	8%	8%	8%	8%	8%
Discount Factor			0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52
Discounted Cashflow	A$ millions real	26	-24	-84	34	20	24	20	19	-18	0
Cumulative NPV	A$ millions real		-24	-118	-84	-65	-9	24	44	26	26
NPV	A$ millions real	26									

1. sales, production, revenue

2. capital Costs

3. operating costs

4. tax

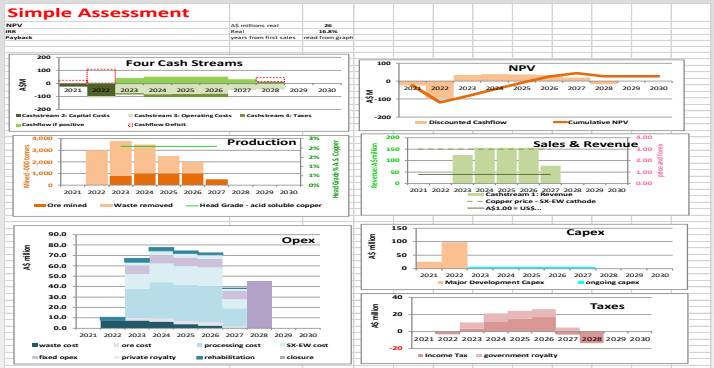
net cashflow, IRR, NPV, Payback

Layout i: Simple Assessments

It is most helpful to add **graphs** so: -

- Others can quickly understand the business
  (Some of us are more visual than numeric)
- You can check for errors in your own modeling

  (When examining a business/project, I first try to get a helicopter view by looking at the IRR, NPV, Payback and the key graphs of price assumptions, sales ramp-up, costs and surplus cash each year.)



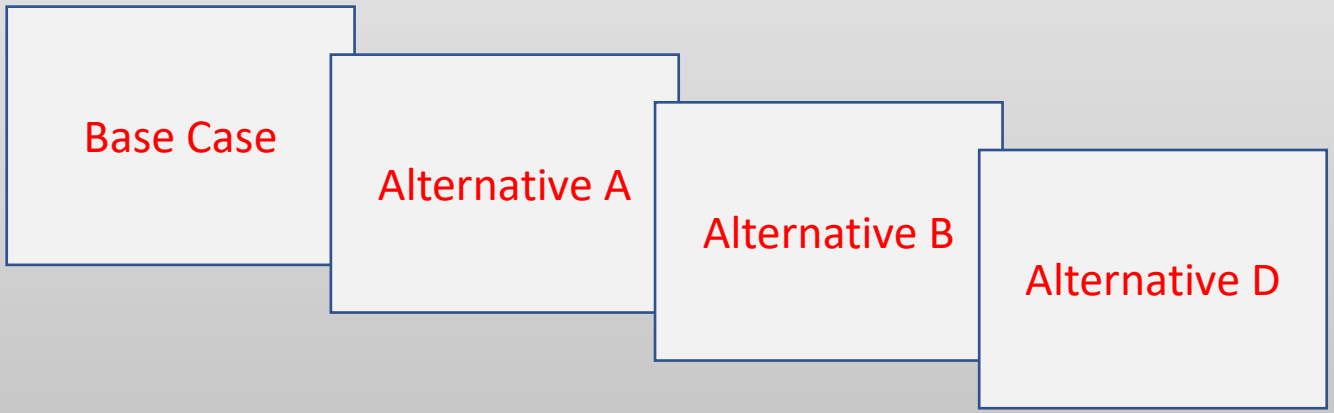
A Simple Assessment

NPV	A$ millions real	26								
IRR	Real	16.8%								
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029
Cashstream 1: Production and Revenue											
Waste removed	000 tonnes	11,000			3,000	3,000	2,500	1,500	1,000	0	
Ore mined	000 tonnes	4,300				800	1,000	1,000	1,000	500	
Head Grade - acid soluble copper	% Cu	0				2.1%	2.1%	2.1%	2.1%	2.1%	
Contained acid soluble copper	000 tonnes	90	0	0		17	21	21	21	11	0	0
Recovery of soluble copper in processing and SX-EW	% Cu	90%				90%	90%	90%	90%	90%		
Output and Sales of Cathode Copper	000 tonnes	81	0	0		15	19	19	19	9	0	0
Sales and Revenue												
Copper price - SX-EW cathode	US$/lb real		3.00	3.00		3.00	3.00	3.00	3.00	3.00		
Output and Sales of Cathode Copper	US$ millions real	536	0	0		100	125	125	125	69	0	0
Forex A$	A$1.00 = US$...		0.80	0.80		0.80	0.80	0.80	0.80	0.80		
Cashstream 1: Revenue	A$ millions real	**672**	**0**	**0**		**125**	**156**	**156**	**156**	**78**	**0**	**0**
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Cashstream 2: Capital Costs												
Major Development Capex												
Major Development Capex	A$ millions real	123	25	98								
Ongoing Capex												
ongoing capex	% of initial capex		5%	5%	5%	5%	5%	5%	5%	5%	5%	
ongoing capex	A$ millions real	31	0	0	6	6	6	6	6	0	0	
Cashstream 2: Capital Costs	A$ millions real	**154**	**25**	**98**	**6**	**6**	**6**	**6**	**6**	**0**	**0**	
Tax deductions for Capital Expenditure												
This assessment:												
Tax Deduction for Capital Expenditure	% diminishing value		30%	30%	30%	30%	30%	30%	30%	30%	30%	
Undeducted capex - opening balance	A$ millions real		0	27	125	131	98	75	58	47	0	0
Undeducted capex - added to pool	A$ millions real	154	25	98	6	6	6	6	6	0	0	0
Undeducted capex - in pool	A$ millions real		27	125	131	98	75	58	47	0	0	0
Undeducted capex - available for deduction	A$ millions real	-609	0	0	131	98	75	58	47	0	0	0
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0	0
Undeducted capex - closing balance	A$ millions real		27	125	92	69	52	41	0	0	0	
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Cashstream 3: Operating Costs												
waste cost - variable	A$ Real/ tonne waste		2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	
waste cost	A$ millions real	28	0.0	7.5	7.5	6.3	5.6	2.5	0.0	0.0	0.0	
ore cost - variable	A$ Real/ tonne ore		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
ore cost	A$ millions real	13	0.0	0.0	2.4	3.0	3.0	3.0	1.5	0.0	0.0	
processing cost - variable	A$ Real/ tonne ore		5%	5%	5%	5%	5%	5%	5%	5%	5%	
processing cost	A$ millions real	151	0.0	0.0	26.0	35.0	35.0	35.0	17.5	0.0	0.0	
SX-EW cost - variable	A$ Real/ tonne cathode		9%0	9%0	9%0	9%0	9%0	9%0	9%0	9%0	9%0	
SX-EW cost	A$ millions real	77	0.0	0.0	14.4	18.0	18.0	18.0	9.0	0.0	0.0	
fixed opex												
fixed opex (site and technical)	A$ M/annum Real		2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.2	
General & Admin	A$ M/annum Real		6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	
fixed opex	A$ millions real	61	0	0	8	8	8	8	8	0	0	
private royalty												
private royalty rate	% of sales revenue		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	
private royalty	A$ millions real	17	0	0	3	4	4	4	2	0	0	
rehab												
rehabilitation	A$ Real/ tonne waste & ore		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
rehabilitation	A$ millions real	15	0	0	4	4	4	2	1	0	0	
closure												
closure	A$ millions real				45	45	45	45	45	45	45	
closure	A$ millions real	45			0	0	0	0	0	45	0	
Cashstream 3: Operating Costs	A$ millions real	**386**	**0**	**11**	**67**	**78**	**74**	**73**	**39**	**45**	**0**	
opex per ore (incl closure)	A$/tonne ore	90	0	0	84	78	74	73	77	0	0	
opex per tonne final product (incl closure)	A$/tonne cathode	4,752	0	0	4,667	4,117	3,932	3,839	4,088	0	0	
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Cashstream 4: Taxes												
Government Royalties												
government royalty rate	% of sales revenue		6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%	
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0	
Income tax												
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0	
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0	
government royalty	A$ millions real	40	0	0	8	9	9	9	5	0	0	
tax deduction for capital expenditure	A$ millions real	156	0	0	39	29	22	18	47	0	0	
Assessable income	A$ millions real	90	0	-11	11	40	50	57	-12	-45	0	
Company Income Tax Rate	% of assessable income		30%	30%	30%	30%	30%	30%	30%	30%	30%	
Income Tax	A$ millions real	27	0	-3	3	12	15	17	-4	-14	0	
Cashstream 4: Taxes	A$ millions real	**67**	**0**	**-3**	**11**	**21**	**24**	**26**	**1**	**-14**	**0**	
Years -->	units	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Cashflow and NPV												
Cashflows												
Cashstream 1: Revenue	A$ millions real	672	0	0	125	156	156	156	78	0	0	
Cashstream 2: Capital Costs	A$ millions real	154	25	98	6	6	6	6	6	0	0	
Cashstream 3: Operating Costs	A$ millions real	386	0	11	67	78	74	73	39	45	0	
Cashstream 4: Taxes	A$ millions real	67	0	-3	11	21	24	26	1	-14	0	
Net Cashflow	A$ millions real	**65**	**-25**	**-105**	**41**	**51**	**51**	**51**	**32**	**-32**	**0**	
IRR	Real	16.8%										
Discounting												
Discount Rate	% Real		8%	8%	8%	8%	8%	8%	8%	8%	8%	
Discount Factor			0.96	0.89	0.82	0.76	0.71	0.65	0.61	0.56	0.52	
Discounted Cashflow	A$ millions real	26	-24	-94	34	39	36	33	20	-18	0	
Cumulative NPV	A$ millions real		-24	-118	-84	-45	-9	24	44	26	26	
NPV	A$ millions real	26										

Layout ii: - Comparing Alternatives

as for

- Day-to-day comparisons
- Prefeasibility or ‘Selection’ Studies
- Cost reduction studies



Central Namibia

Layout ii: Comparing Alternatives

Building a model that compares alternatives has four steps : -

Step 1: Create the 'Common Inputs & Results' worksheet
and enter the common inputs

common inputs & results

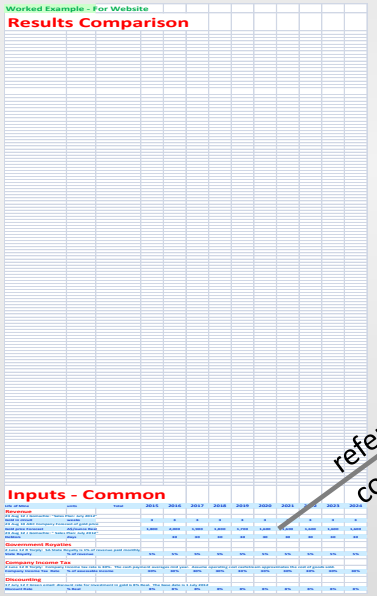
Base Case

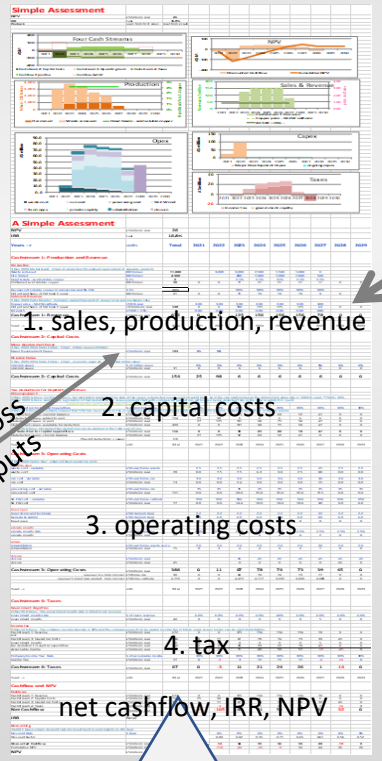
Alternative A

Alternative B

Layout ii: Comparing Alternatives

Building a model that compares alternatives has four steps : -





reference across common inputs

1. sales, production, revenue

2. capital costs

3. operating costs

4. tax

net cashflow, IRR, NPV

Step 2: Create the worksheet for the "base case"

- Use the 'four cashstreams' structure
- Reference across the common inputs
- Generate the graphs

- Check its inputs against the source data
- Check if the results make sense

common inputs & results

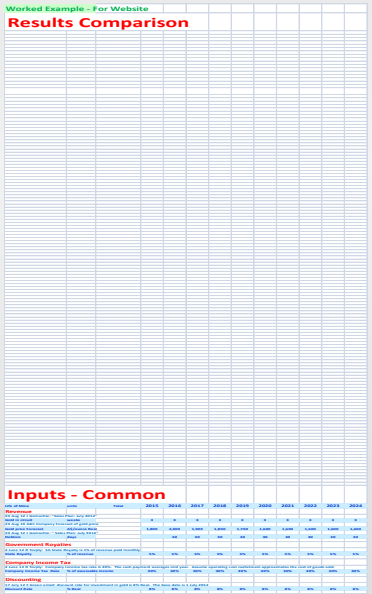
Base Case

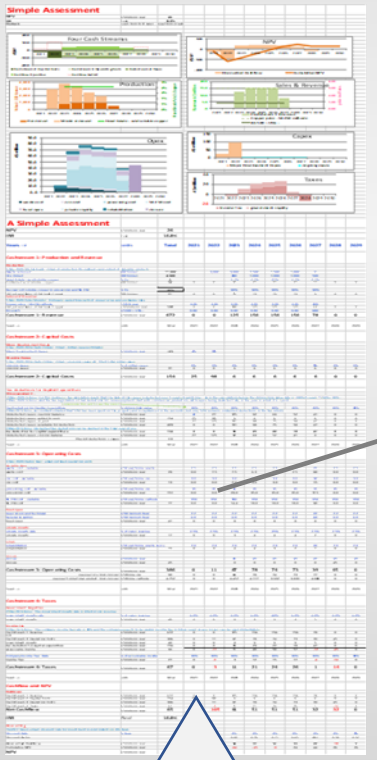
Alternative A

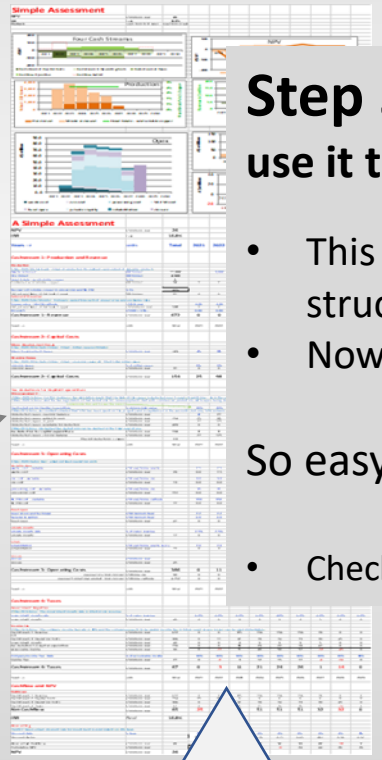
Alternative B

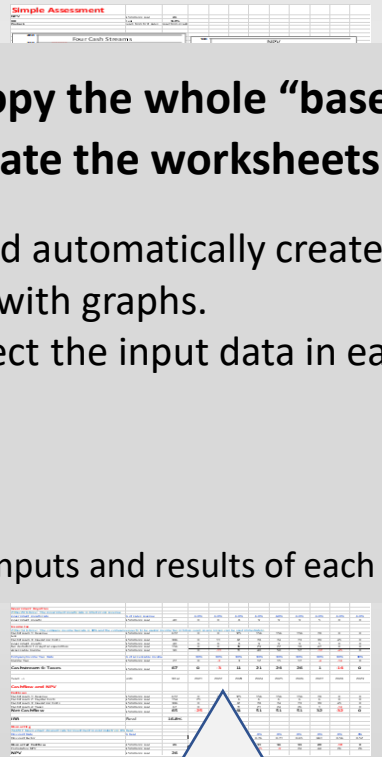
Layout ii: Comparing Alternatives

Building a model that compares alternatives has four steps : -









Step 3: Copy the whole "base case" worksheet and use it to create the worksheets for the alternatives.

- This should automatically create the 'four cashstreams' structure with graphs.
- Now correct the input data in each alternate scenario,

So easy!

- Check the inputs and results of each alternative

common inputs & results

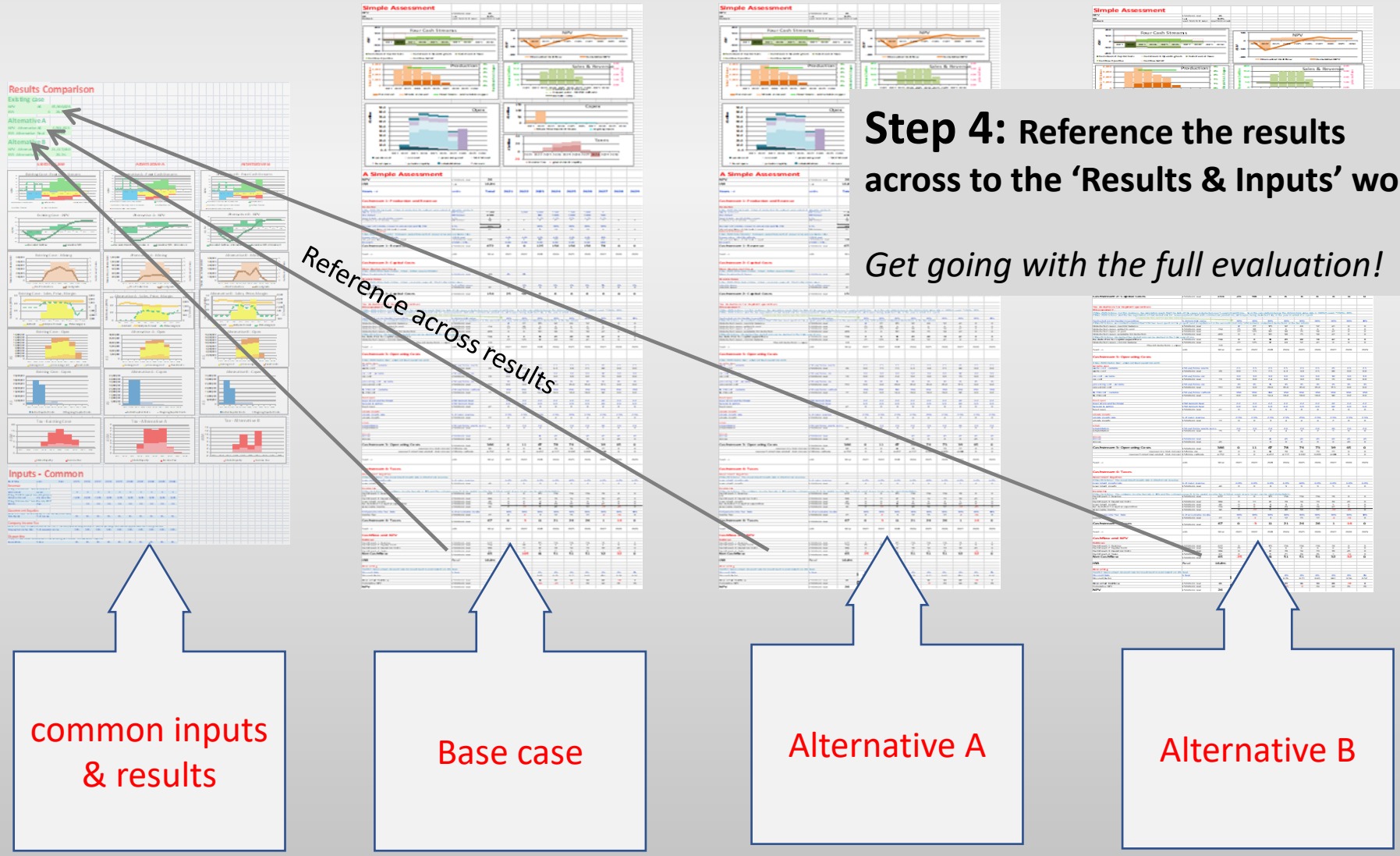
Base case

Alternative A

Alternative B

Layout ii: Comparing Alternatives

Building a model that compares alternatives has four steps : -

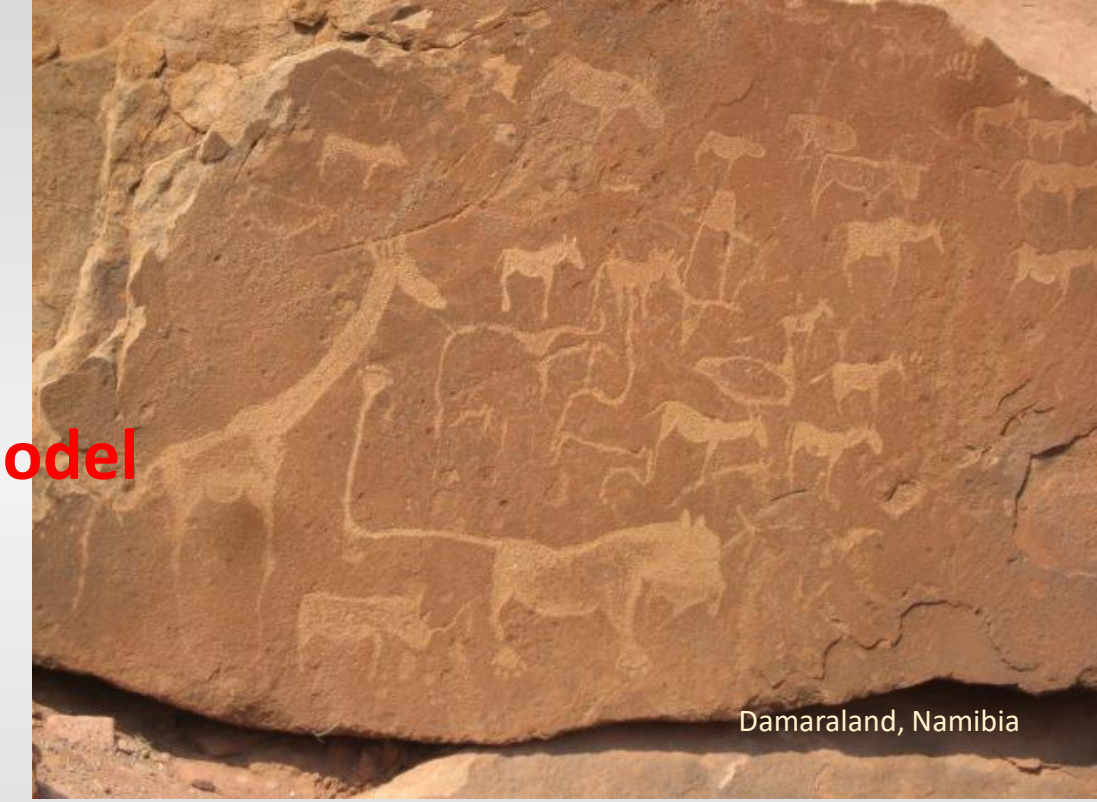


Step 4: Reference the results across to the 'Results & Inputs' worksheet

Get going with the full evaluation!

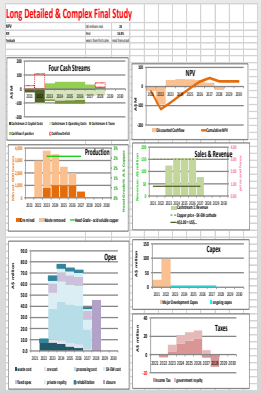
Layout iii: One long, detailed, complex model

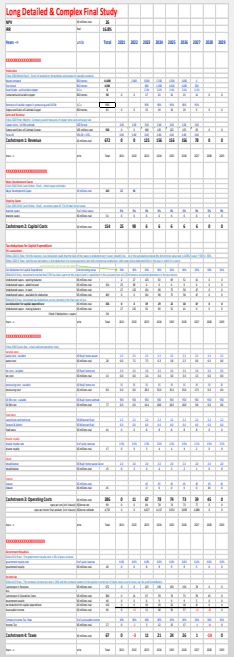
- ‘Final Feasibility’ Studies
- Acquisitions and divestments
- Major assessments of projects incl technology
- Major assessments of operations
- Major assessments of a whole business

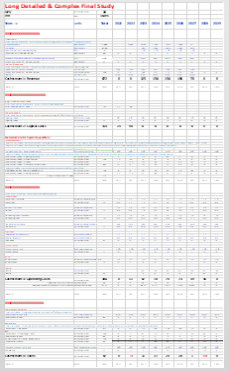

Damaraland, Namibia

are likely to require a business model that is → **long, detailed & complex**

Layout iii: Creating a long, detailed and complex model



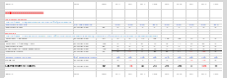




1. **Create the 'Key Inputs & Results' worksheet**
2. **Create each of the four 'cashstream' worksheets**
   you decide which worksheets are appropriate → example below.
3. **Collate into the 'cashflow' worksheet**
4. **Create the graphs**
5. **If/when needed, add the accounting and financing worksheets**

- Check inputs in each scenario against the original source data, and
- Check the results using the numbers and visually using the graphs

Most important: Build in obvious small steps so everything is intuitive.



key inputs & results

production, sales, revenue

capex

opex

Taxes

Cash flow NPV, IRR, etc

accounting

financing

Level 3: Decision making

Level 2: Evaluating the business/project

Level 1: Hands-on economic modelling


Fish River Canyon, Southern Namibia

Guiding principles: -

- ***A business case must employ rigorous modelling practices to become easy-to-understand, transparent and robust!***
- ***The model may become long, detailed and complex but it must always remain intuitive for <u>others</u> to follow.***
- ***The model is only a workhorse*** *(There is a lot, lot more to do other than pumping out NPV, IRR & payback)*

In the next modules let's look at ways of making each one of your models intuitive for others.

End

Namibia