

Life Cycle Costing at Rio Tinto Iron Ore

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Rio Tinto Iron Ore

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- Who are we?
- Where are we?
- Operations & Infrastructure
- Production
- Heavy Mobile Equipment Population
- Heavy Mobile Equipment in the Value Chain
- Heavy Mobile Equipment Strategy Process
- What is LCC, why we do it and its Challenges
- Lessons Learned
- Questions

Rio Tinto

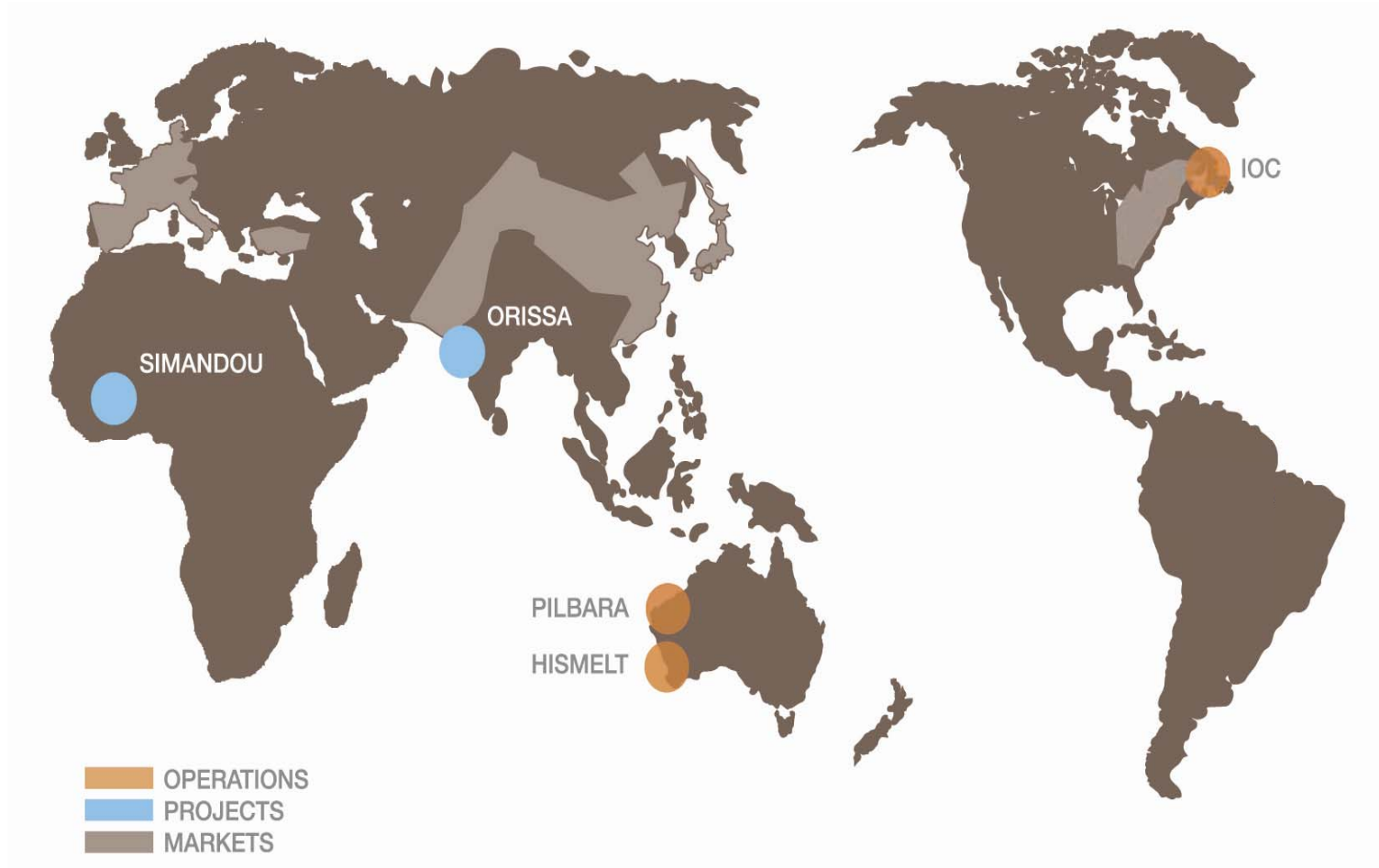
2nd largest listed mining company

Employs >36000 people across the globe

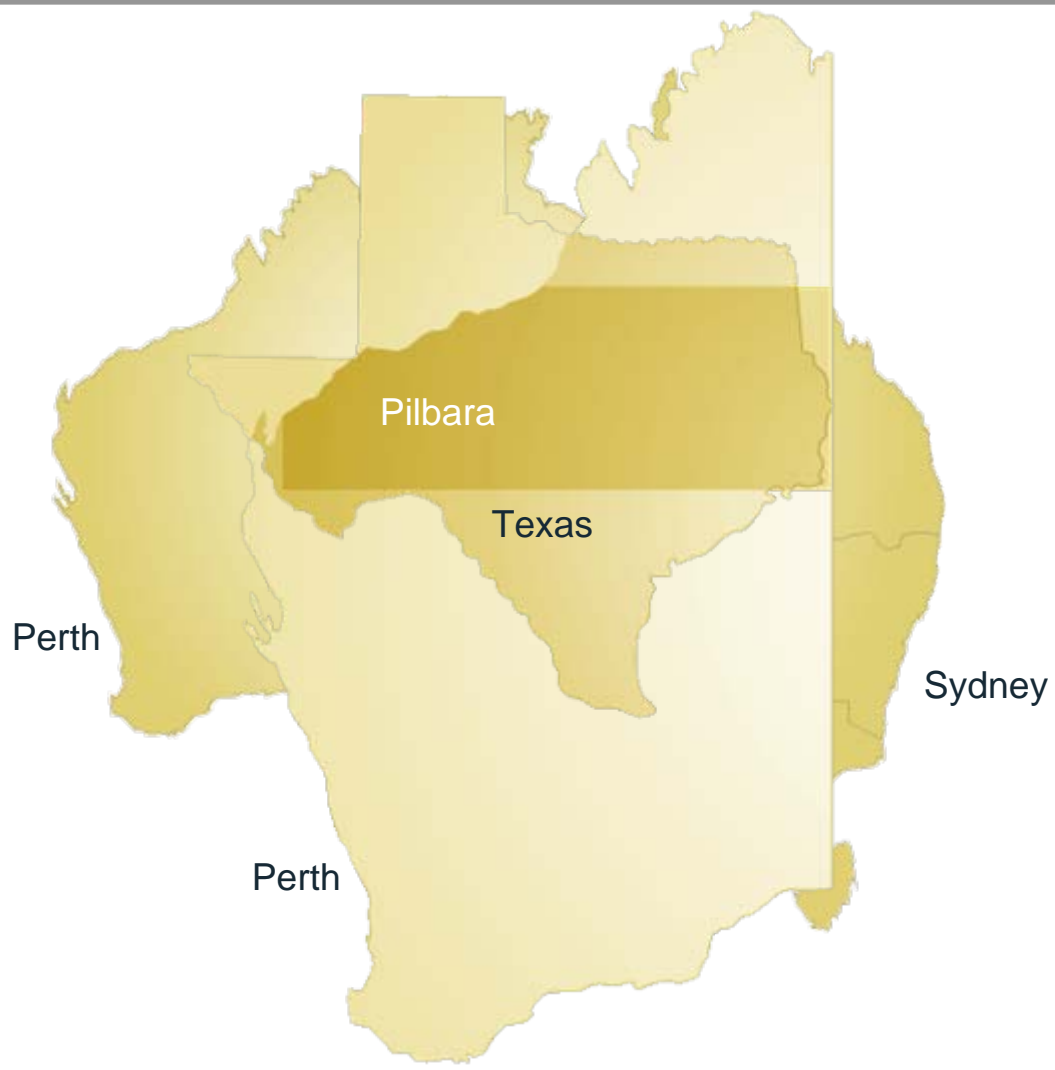
Operating Assets: USD 20.7 billion

Record net earnings in 2008: USD 10.3 billion

Aluminium
Alumina
Bauxite
Borate
Coal
Copper
Gold
Gypsum
Iron Ore
Molybdenum
Lead
Nickel
Silver
Salt
Sulphuric Acid
Talc
Tin
Titanium Dioxide
Uranium
Zinc

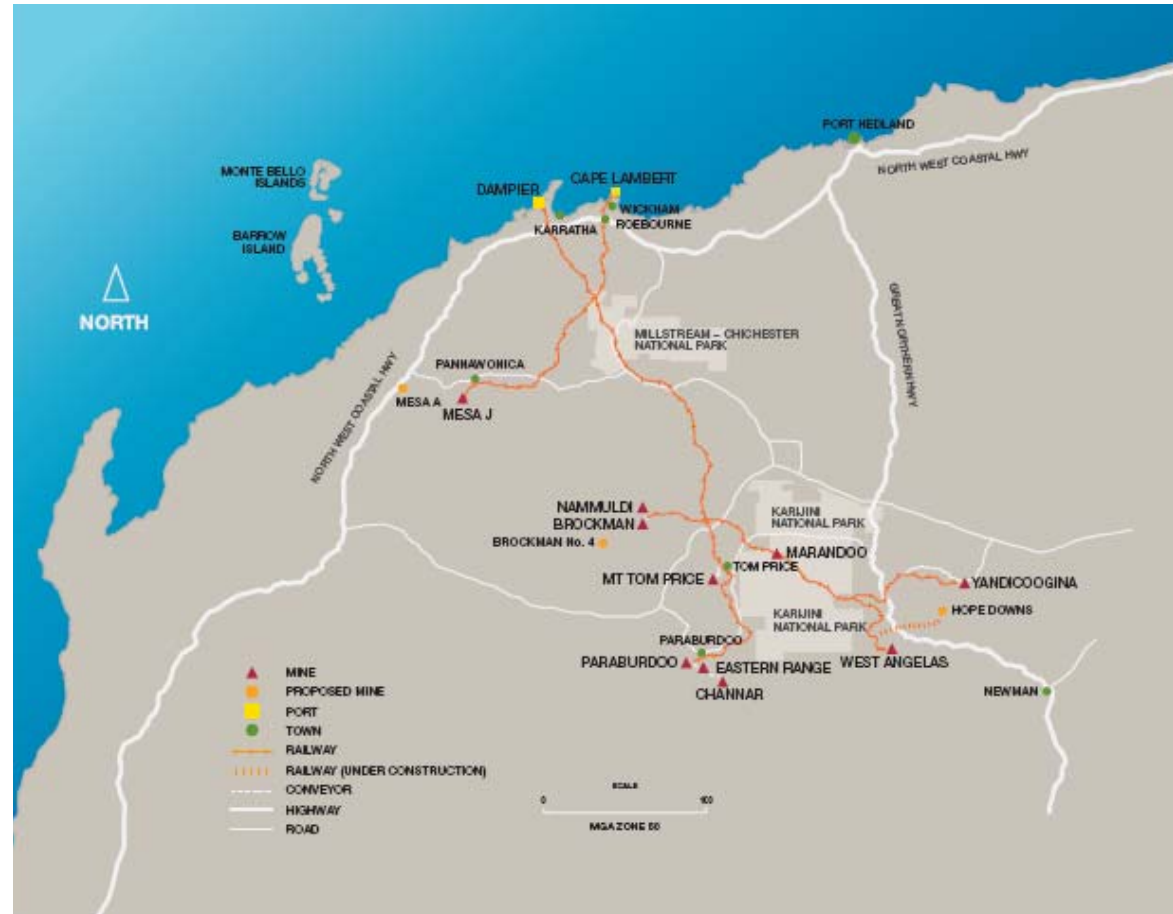


Rio Tinto Iron Ore – a global iron ore business

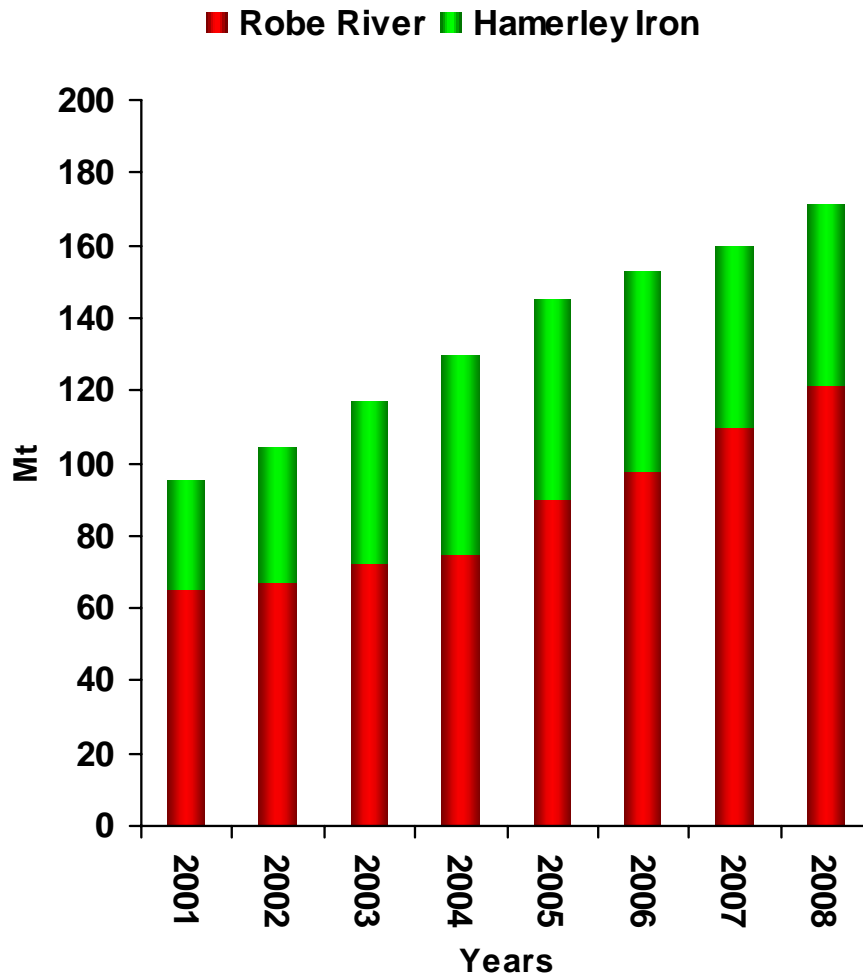


- NW Western Australia
- 1600 km North of Perth (State Capital)

- Growing to 11 mines and utilise 3 port facilities for shipping
- Own, operate and maintain the largest privately owned heavy freight rail network in Australia
- At the end of 2008 RIO employed 7660 people in WA
- Contributed ~ US\$6 billion in export revenue in 2008

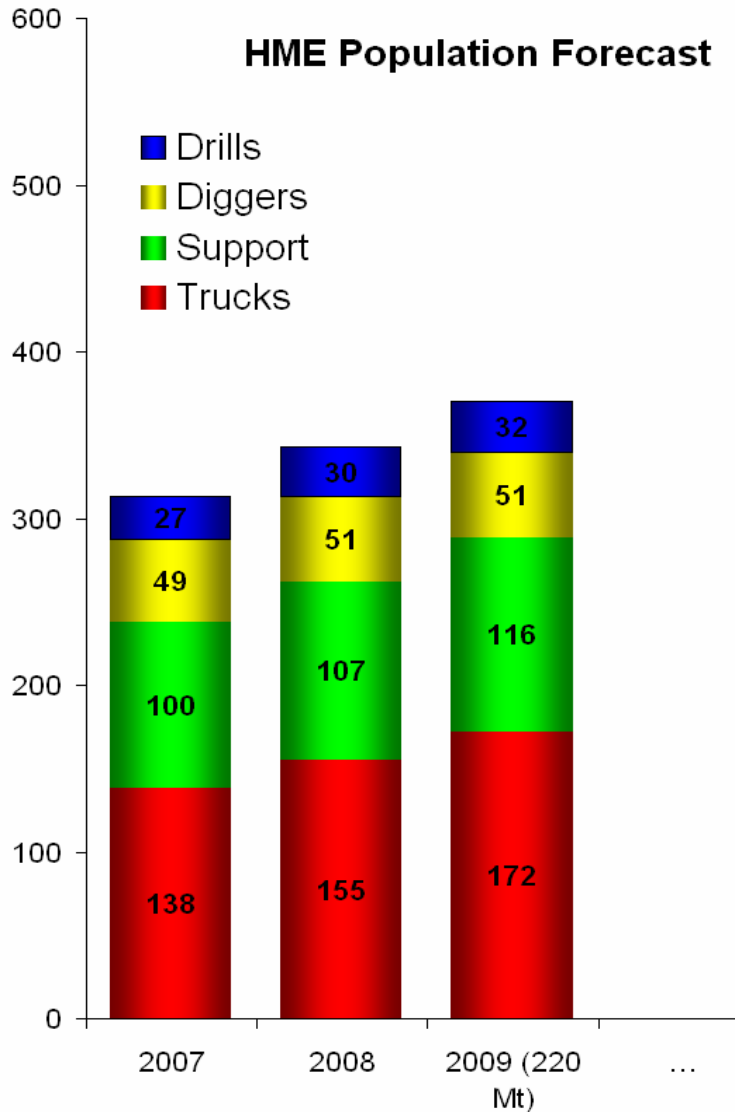


Shipments

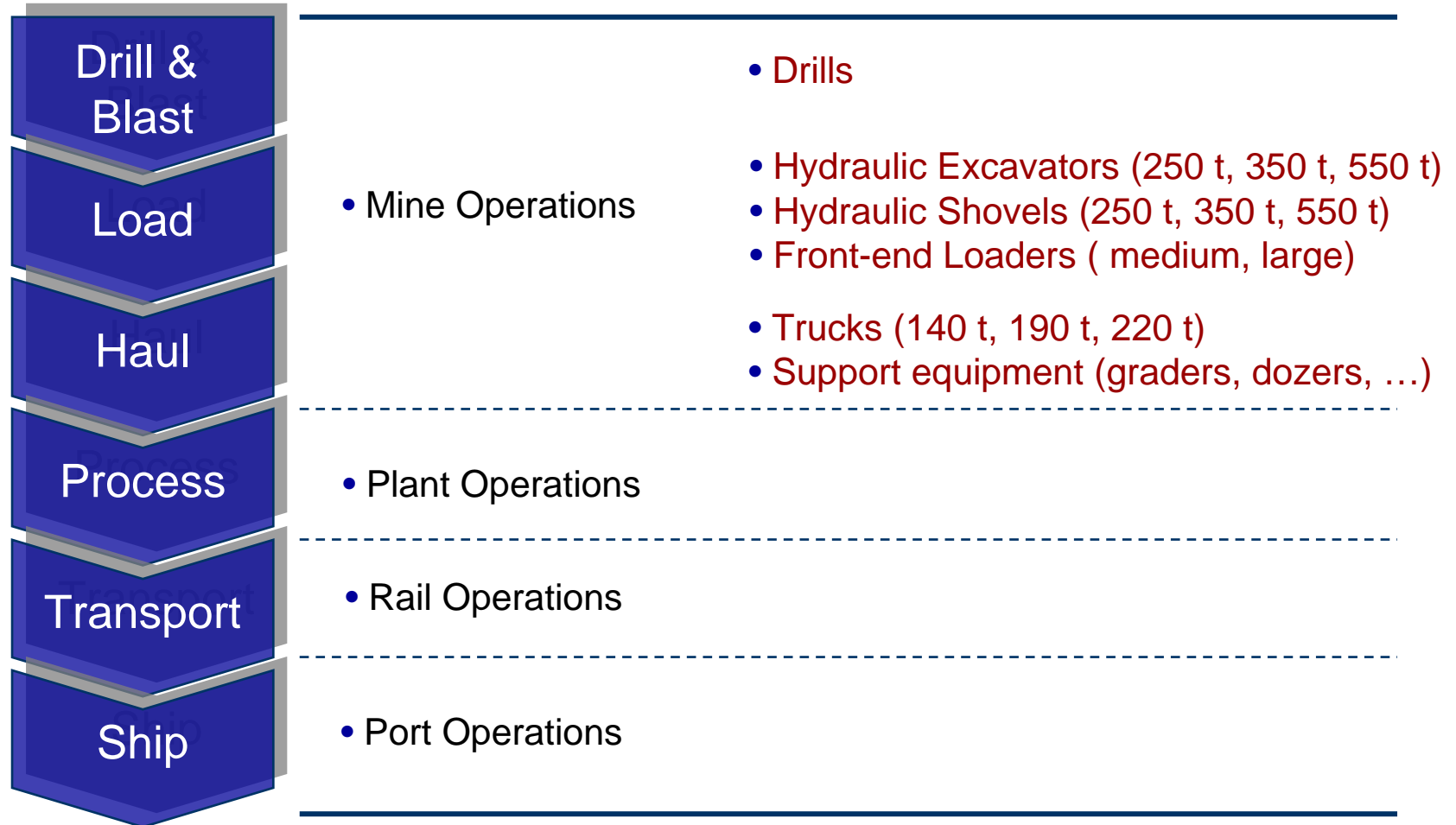


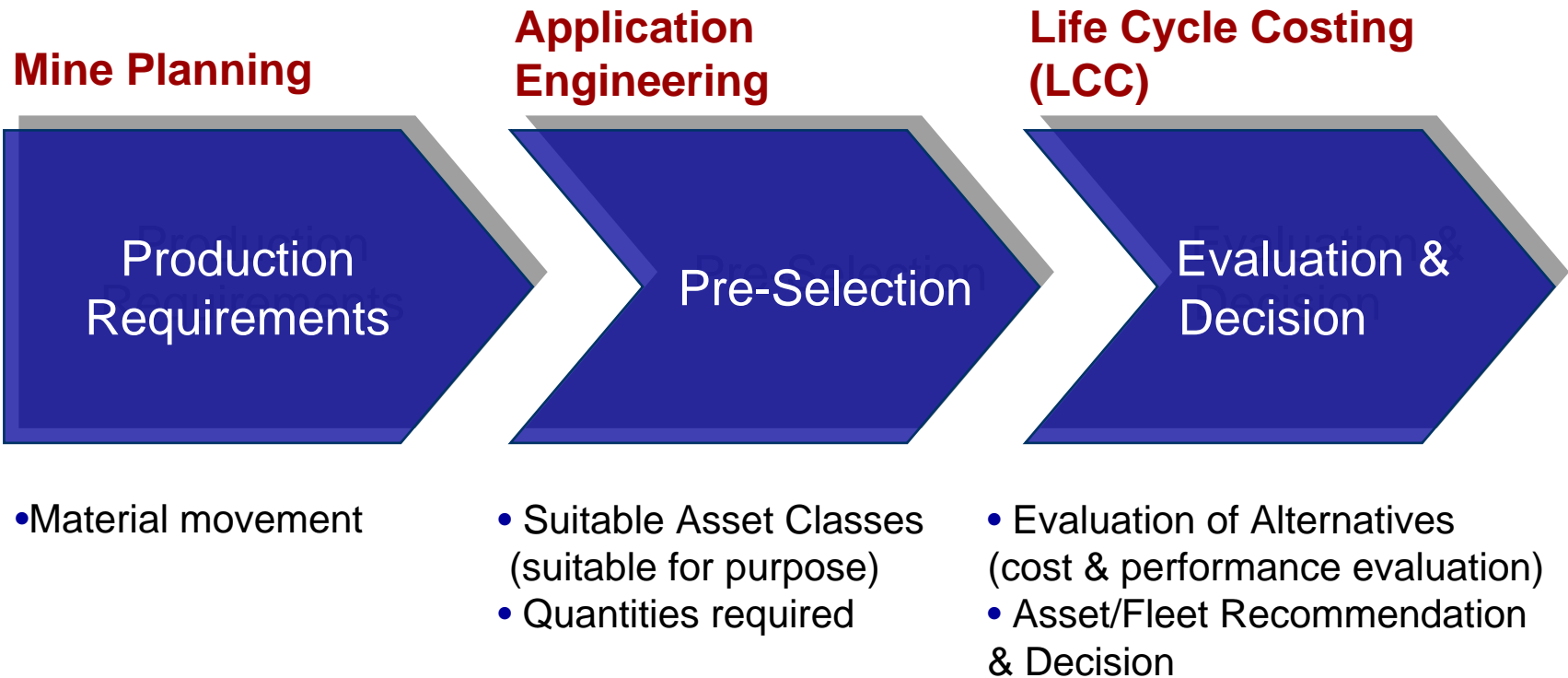
In 2008 exported 171.4 Mt
of iron ore produced
from Pilbara mines

Represented ~ 55% of
total iron ore exports
from Australia in 2008



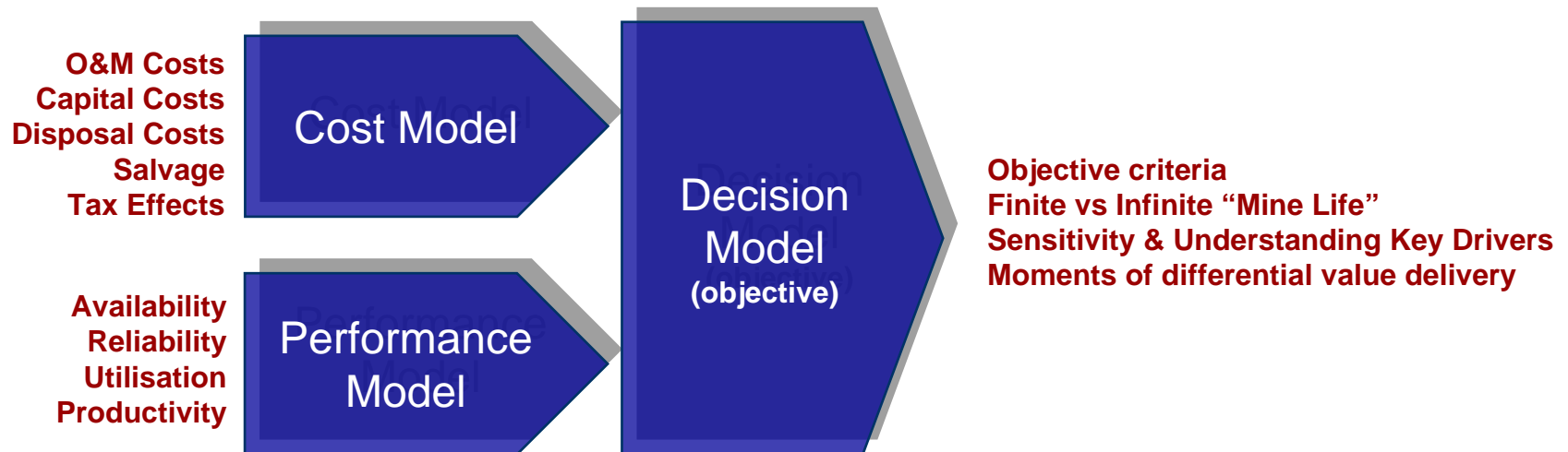
- HME requirements driven by production plans
- Uncertainty of the number of additional HME required over the next 5-6 years





“A process to determine the sum of all expenses associated with a product, including acquisition, installation, operation, maintenance, refurbishment, discarding and disposal costs.” (AS/NZS 4536:1999)

Within RTIO, this includes the economic evaluation as well.



Challenges for HME Strategies

- Changing in the market conditions with the consequent changes in production budgets
- **Capital constraints** will required increase the productivity in order to minimise the \$/tonne and achieve production targets
- **HME allocation** has had and relative increment in its importance
- HME Strategy will has to consider the **availability of service resources** as part of the decision criteria

Model Development

- A**
↓
B
- Data acquisition of “**actuals**” (historic cost and performance information)
 - **System analysis** (service resources availability and interactions between machines [O&M])
 - Valuation of Production Losses (Value Chain impacts)
 - Fleet Modelling (In conjunction with Performance Engineer)
 - **Uncertainties and Risk**

Model utilisation

- **Stakeholder identification, diffusion of the methodology and models**

A

- **Actual data and accuracy:**

Always and a big challenge for LCC and any decision making process based on information. It is the main focus of the LCC area to achieve an robust process of data acquisition. Better the data, better the model and the better the answers to stakeholders.

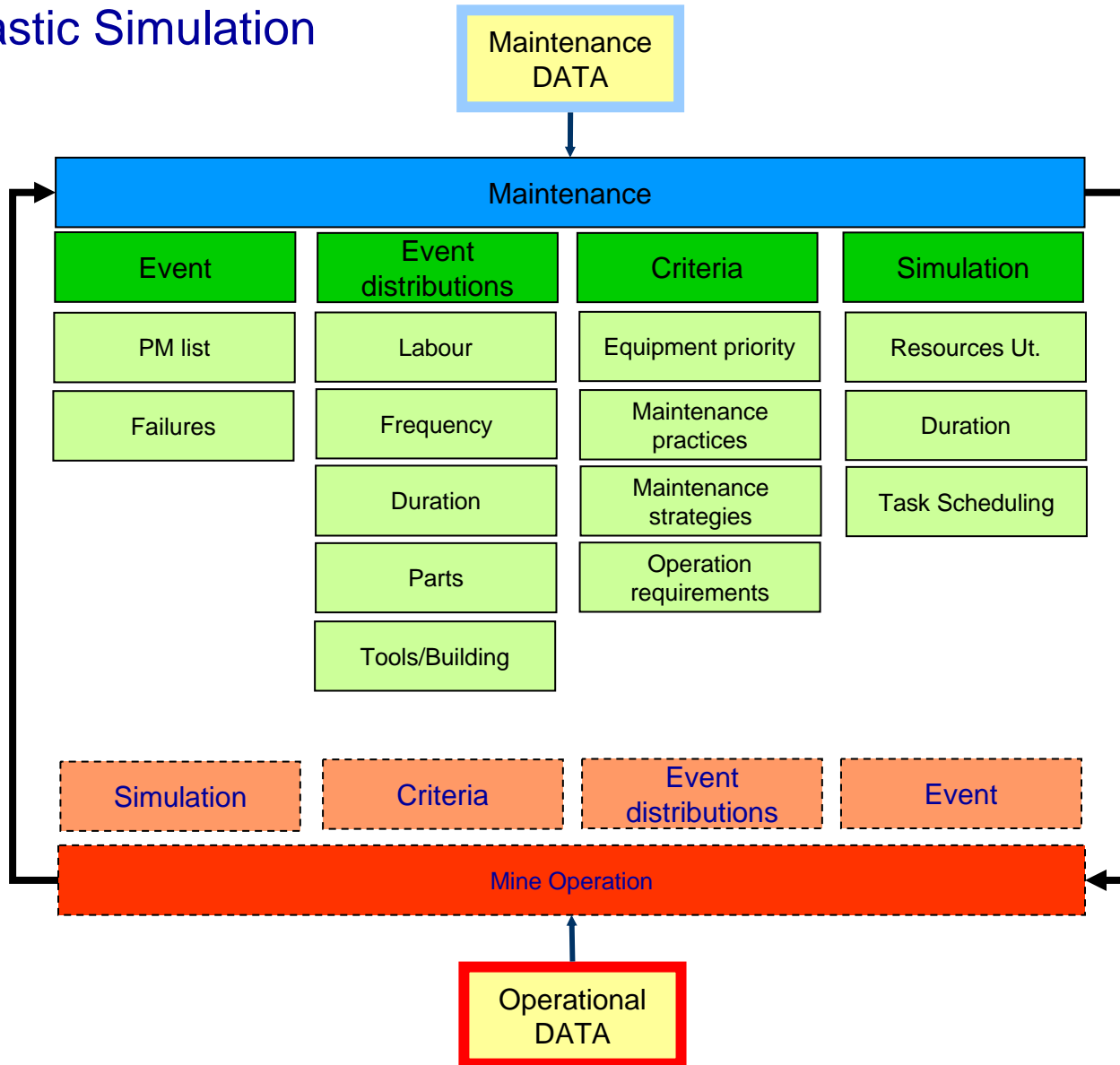
A starting point is the analysis of the sources and their weaknesses.

Example:

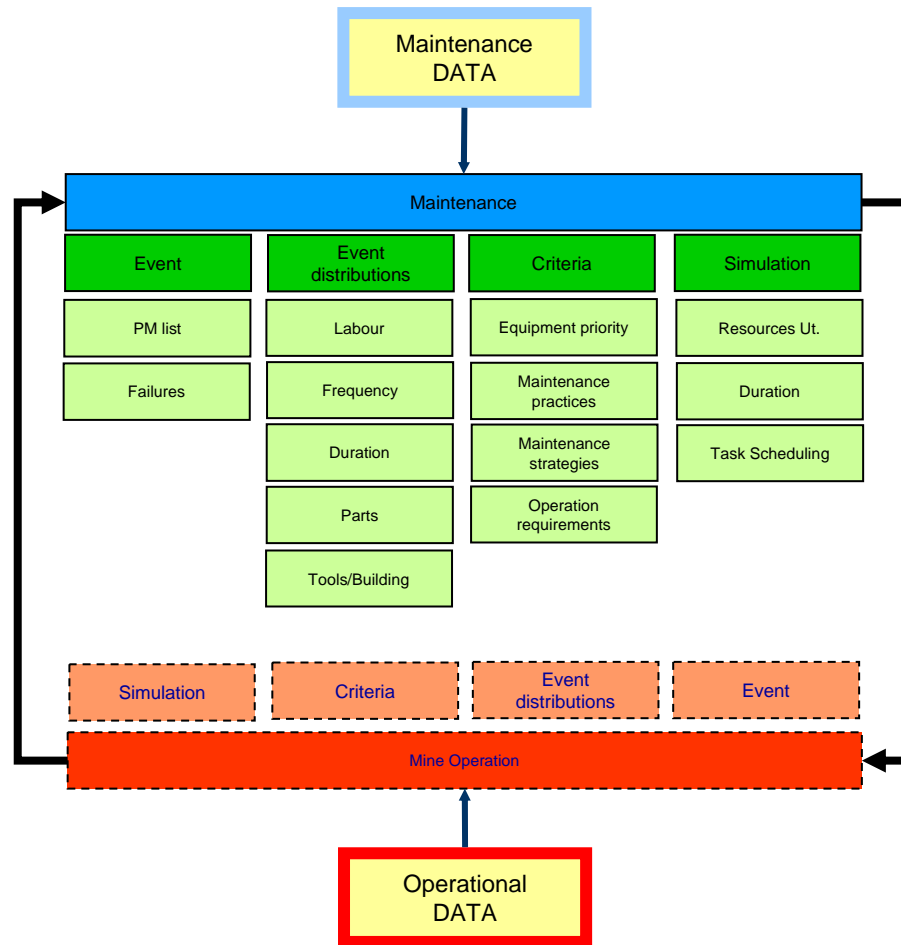
Cost information used on the LCC was based (2007-2008) on Work orders information. The main focus of the work order is to get am specific work done, the accuracy of the information in the long term is irrelevant to the “people” in charge of the generation of those work order. The results, inaccurate information that require a lot of effort to make it useful (time and resources).

Other possible source of similar cost information from the warehouse/inventory, the accuracy of this systems are a lot more consistent because of the regulations requirements (taxes and other system obligations). This information also is supported and understood by the whole organisation.

Stochastic Simulation



Stochastic Simulation



The simulation will give us a more thorough vision of the reality. (parametric, though)

The outputs of the process will be the same as the values we can get from the data systems. (Cost, production, failures, etc.)

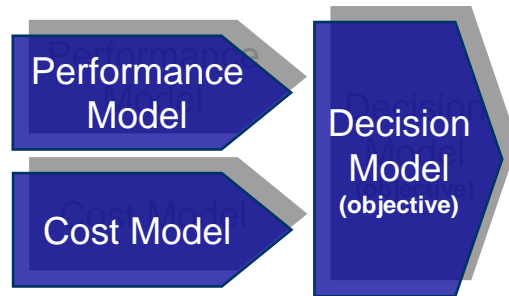
It provide us with the capability to do:

- System analysis
- Valuation of Production losses
- Fleet Modelling

- **System analysis**

- It is important to understand the impact of the work environment over the performance (\$/T or \$/hr) of an asset.

For a LCC it is very important to reproduce the condition where the asset will work in the closest way possible.

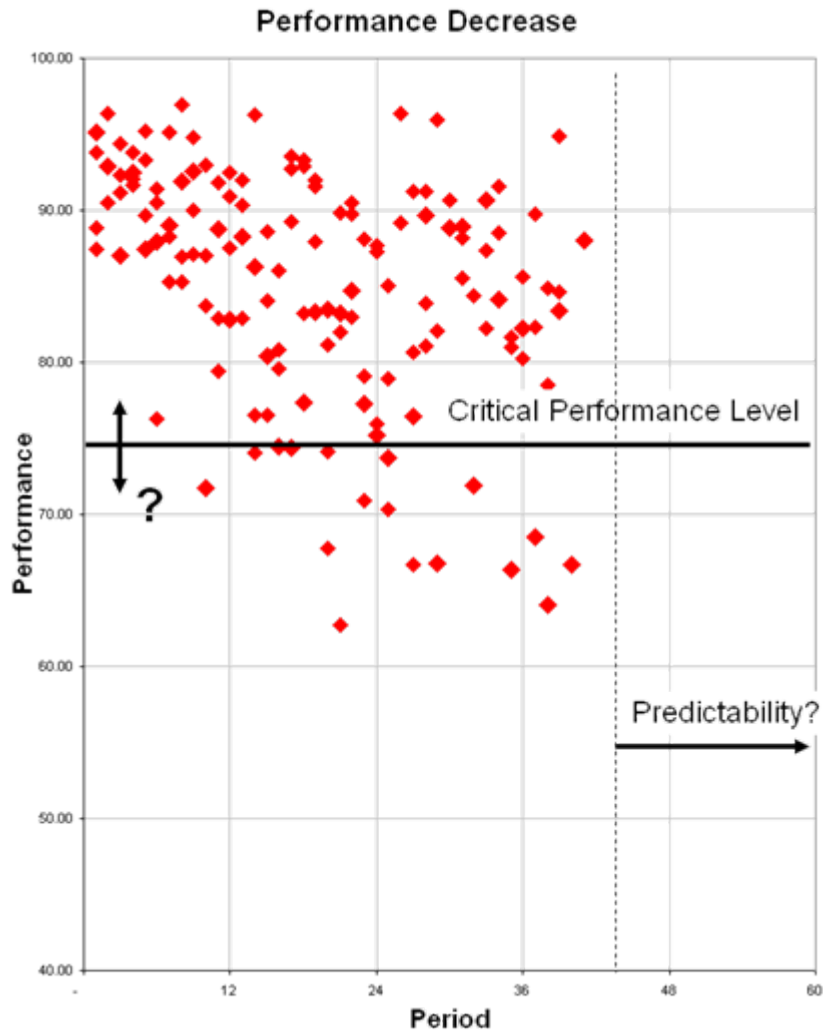


We are in a business where the maintenance resources are scarce and we have on a daily basis our assets competing for them. In this regard we found that the interaction of assets is a very important variable necessary to consider in their LCC.

If we include an old machine in an operation, this machine will attract maintenance resources and would impact the \$/t or \$/hr of the rest of the fleet as a consequence of the increment of the TTR.

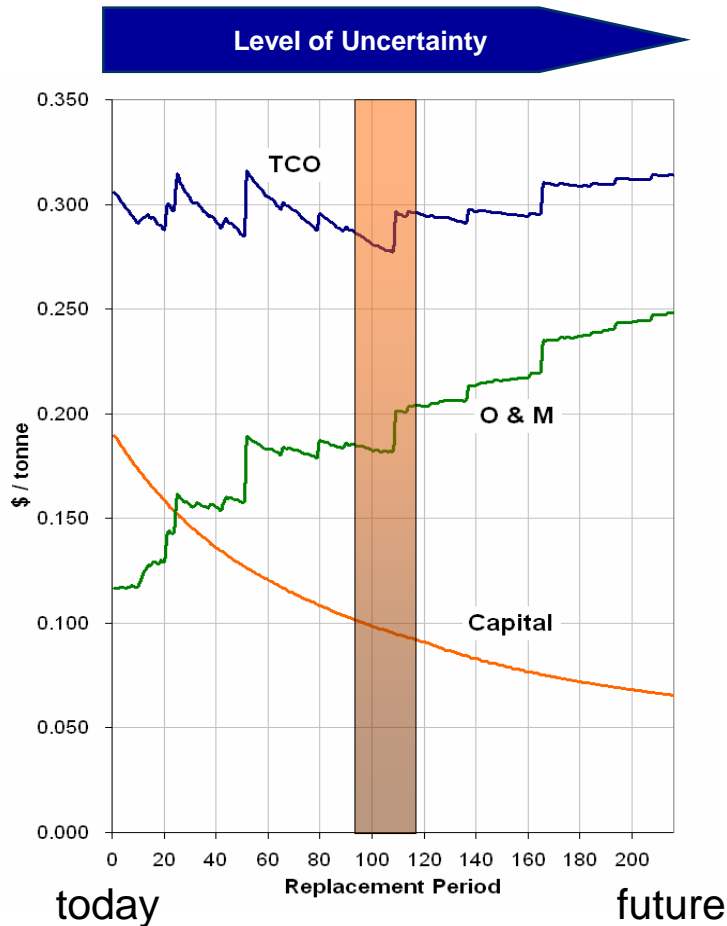
In this regard, the ALCM will be used as an Allocation methodology.

- Valuation of Production Losses (Value Chain impacts)



- What are the production loss assumptions?
 - Assume fit for purpose?
 - Critical level required (fleet requirements)?
- How do we incorporate production losses?
 - Opportunity costs?
 - NPV instead of NPC (profit centre)?
- Predictability of performance outside of historical information boundaries?
 - The Stochastic simulation will help us with the interactions but the predictability will remain as a gap.

- Uncertainties & Risks



- Intervals between expenses and Costs are stochastic and subject to high level of uncertainty. But using simulation we will keep all the distributions active for each model so wont lose accuracy, the result will be a range of possibilities (the simulation has to be run many times).
- Risks & uncertainties associated with costs, performance and capital (salvage) into the future are different – different discount rates?
- Uncertainties and risks need to be incorporated to give an accurate and representative picture to senior mgmt.

- **Fleet Modelling**

- The Allocation of pieces of equipment could be a very complicated task to achieve...

Example:

How to go from 7 Excavators to 4 Excavators and 3 Shovels, either through conversion or replacement, given specific lead times?

Replacement

Replacing 3 x EX3600s by 3 new EX3600 Shovels @ May/08, Jul/08 and Oct/08 and keep on running the remaining 4 excavator – **210 alternatives**

Conversion:

Converting 3 x EX3600 Backhoes to Shovels @ Aug/08 and keep on running the remaining 4 excavators – **35 alternatives**

- LCC has given us the tools to evaluate fleet alternatives using common criteria, and reduce total costs of ownership
 - Based on facts (data-driven): actual performance & costs
 - Standard process
 - Transparent & Logical
 - Driving supplier contribution to reduce costs (competitiveness)
- Has enabled us to understand major cost drivers: focusing attention
- Has challenged myths and “embedded” opinions on machines, performance and replacement points: increasing understanding of equipment financials
- Has delivered us a comprehensive valuation tool that brings together all roles into the capital decision process (procurement, reliability/maintenance engineers, mining engineers), and test their ideas

Questions?